An exploratory trial exploring the use of a multiple intelligences teaching approach (MITA) for teaching clinical skills to first year undergraduate nursing students.

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An exploratory trial exploring the use of a multiple intelligences teaching approach (MITA) for teaching clinical skills to first year undergraduate nursing students

by

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Linda Sheahan

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Abstract

The clinical competency of pre-registration nursing students has raised questions about the proficiency of teaching strategies used to teach clinical skills in the undergraduate nursing programme. This study aimed to test the effectiveness of teaching clinical skills using a multiple intelligences teaching approach (MITA), which is underpinned by Gardner's theory (1983) of multiple intelligences.

This study employed a randomised controlled trial with first year nursing students (n=90) in one third-level institute in Ireland. Participants were randomly allocated to a control group (conventional teaching) (n=44) and an experimental group (MITA intervention) (n=46) to learn clinical skills. From a suite of twelve clinical skills taught, three clinical skills were assessed and included hand washing, sub cutaneous injection and nebuliser therapy. The outcome was skill performance measured by the results in an objective structured clinical examination (OSCE).

Participant preference for learning was measured by the Index of Learning Styles (ILS). Participants' multiple intelligence (MI) preferences were measured with a multiple intelligences development assessment scale (MIDAS), which included intellectual styles. MI assessment preferences were measured by a multiple intelligences assessment preferences questionnaire. The MITA intervention was evaluated using a questionnaire.

Results showed that participants in the experimental group had higher scores in all three OSCEs examined ($p<0.05$) at Time 1, suggesting that MITA had a positive effect on clinical skill acquisition. The strongest preference on ILS for both groups was the sensing style. The highest MI on the MIDAS questionnaire for both groups was interpersonal intelligence. The assessment preferences questionnaire results showed that the majority of students favoured practical examinations, followed by multiple choice questions and short answer questions, as methods of assessment. The participants in the experimental group were positive about the MITA intervention.

The findings of this study support the use of MITA for clinical skills teaching and advance the understanding of how MI approaches to teaching may be used in nursing education. This study builds upon the limited body of knowledge regarding the use of MI teaching strategies in a third level setting for clinical skills teaching. The findings may assist nurse educators in their choice of teaching strategies for clinical skills teaching that meets learner needs and promotes effective learning. Future research is needed to test the effectiveness of using the MITA intervention in practice placement settings to augment clinical skills laboratory teaching.

Dedication

To my parents Larry and Breda: you always encouraged me to work hard and believed that education was the best gift you could give a child. You are the reason I have achieved so much.

To my husband Paul: I have been studying since we met but your unwavering love and support helps me through everything I do. Thank you for all your love, help and encouragement throughout this long process.

To my sons Ruairí and Donnacha: This past six years has been difficult for you watching me at the computer working. I love you both very much and you have kept my spirits lifted when I needed it most.

To all my family, extended family and friends: Thank you for your support and help when required. It is much appreciated. To Caroline who started this journey with me and who gave me the encouragement to persevere with the hard work.

Acknowledgements

A friend once said "*it is not the destination but the journey that is important*". The journey has been long and I could not have done it without the help of a number of people.

I am particularly grateful and appreciative of the help of my supervisors Professor Alison While and Dr. Jacqueline Bloomfield. Their support, advice and constructive critique of this study has led to the completion of this work.

To all the students who took part in the study. Thank you for your taking part so enthusiastically in this study and for the journey we had together in the skills laboratory. This study would not have been possible without your assistance and hard work.

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Instrumentation

ILS: Index of learning styles (Felder & Silverman 1988)

MITA: Multiple intelligence teaching approach (Weber, 1999)

MI Assessment questionnaire: Assessment tool developed by the researcher

MIDAS: Multiple intelligences development assessment scale (Shearer, 1996)

Definition of terms

For the purpose of this research, the following definitions apply:

ABA:	An Bord Altranais
AHA:	American Heart Association
AV:	Audio visual
BP:	Blood pressure
CAL:	Computer assisted learning
CAO:	Central applications office
CMS:	Course management system
CSL:	Clinical skills laboratory
EAQA:	European Association for Quality Assurance
HETAC:	Higher Education and Training Awards Council
HPS:	Human patient simulator
HSE:	Health Services Executive
ILS:	Index of learning style
IQ:	Intelligence quotient
IS:	Intellectual styles
IT:	Information technology
NHS:	National Health Service
NMC:	Nursing and Midwifery Council
NQAI:	National Quality Authority Ireland
MI:	Multiple Intelligences
MIDAS:	Multiple intelligences development assessment scale

MITA:	Multiple intelligences teaching approach
MRC:	Medical Research Council
OSCE:	Objective structured clinical examination
PASW:	Predictive Analytical Statistical Software
RCT:	Randomised control trial
RN:	Registered nurse
SP:	Standardised patient
TPR:	Temperature, pulse, respiration
UK:	United Kingdom
URL:	Uniform resource locator
USA:	United States of America
VLE:	Virtual learning environment
WHO:	World Health Organisation

Chapter 1- Background to the Study

Introduction

This chapter introduces the research study and provides the background, purpose and rationale for undertaking this study. This chapter situates the research study in the context of professional practice in nursing education. The subsequent chapters will present the background for clinical skills learning and teaching in nursing; explore and review the literature in relation to learning style theory and multiple intelligences; and critically discuss the methodology and methods chosen to carry out the study. The last two chapters will focus on a presentation of the results, the discussion and the findings in relation to education, research and practice.

1.1The research study

This study tested the effectiveness of using a multiple intelligences teaching approach (MITA) for clinical skills teaching and learning. The research project was carried out in the Republic of Ireland with first year undergraduate nursing students. The study aimed to measure the effectiveness of MITA as a teaching approach for clinical skills education. Using a randomised controlled trial (RCT), this study compared the use of MITA and conventional teaching approaches for clinical skills education.

1.2 Nursing developments globally

The realities of globalisation and the current economic climate affecting healthcare in the 21st century are radically changing the landscape of nursing practice in Ireland and worldwide (O' Shea 2008). These realities relate to profound changes in how patients have become more active regarding their own health care. In addition, accountability and clinical governance have radically transformed nursing practice through an improved monitoring of healthcare performance (McEvoy et al. 2008). Accountability

means that the nurse has to account for his/her practice and the decisions that he/she makes (ABA 2000). Clinical governance is identified as a means of improving protection of the patient against poor practice and helps make clinical decision making more effective (Hope 2003). In recent years there has been a further development of the nurses' role that requires a higher level of skill, knowledge and levels of competency (O' Shea 2008). This starts with undergraduate nursing education.

It has been reported that there are fewer clinical areas available for practice placement coupled with less qualified nurses available for supervision (Nehring & Lashley 2009; Stayt & Merriman 2012). Additionally, patients are having shorter hospital stays which creates fewer experiential learning opportunities for nursing students in the clinical area (Midgley 2005; Stayt 2011; Stayt & Merriman 2012). Ballie and Curzio (2009) and Stayt and Merriman (2012) have suggested that this problem is worldwide, as they described the learning experiences and opportunities for learning clinical skills as variable. Equipping students with the relevant knowledge, skills and attitudes, which constitute competency, should help the student adapt to the many changes in the clinical setting that have happened as a result of these global changes (Benner et al. 2010). Nurse educators are continually faced with finding ways to prepare students, both theoretically and practically, who are fit for purpose and fit for practice (Stayt 2011). This should encourage educators to question the ways that students are taught and prepared for the practice of nursing.

1.3 Nurse education in Ireland

Reform in nursing education in Ireland has been influenced by national, European and international nursing educational trends (Tully 2002; National Qualification Authority of Ireland (NQAI) 2004). The Bologna process, initiated in 1998, has changed the landscape of nursing education in the European Union by improving the international comparability of nursing programmes and providing similar academic requirements for nursing at entrance level (Zabalegui et al. 2006). The Tuning Project in Europe has had an impact on the development of pre-registration education in Ireland by identifying

core competencies that need to be achieved by nurses across Europe (Gonzalez & Wagenaar 2008) (Appendix 1). These include competencies associated with nursing practice and clinical decision making.

The education of nursing students in Ireland takes place in third level colleges (7 universities and 7 institutes of technology) in conjunction with clinical partners. All students who successfully complete the programme achieve a Bachelors of Science with honours in general, psychiatric, intellectual disability, paediatrics or paediatrics and general (integrated) nursing. In Ireland, since 2002, entry to nursing education has been a degree level entry profession and this is considered a major strength of the Irish nurse education programme. This is different to the United States of America (USA) where variations occur with a mixture of diploma and degree entry level. The United Kingdom (UK) has only moved to a degree entry level as the minimal educational level in the past year. A further strength of the Irish nursing education programme is the emphasis placed on the clinical component and this must include at least half of the programme hours (ABA 2005).

In 2002 nursing education in Ireland progressed into the higher education sector, but still maintained very close links with health care practice. Since the introduction of the national pre-registration degree programme, there has been a shift in clinical skills learning and teaching in the undergraduate nursing curriculum. In the past in Ireland, the teaching of nursing skills was facilitated solely in the clinical areas by the nursing staff and was based on the apprenticeship model of training. The apprenticeship model was task orientated and service needs took priority (Simons et al. 1998). Learning clinical skills situated in the clinical environment was considered appropriate at that time as the qualified nurses were considered to be the clinical experts and could pass on their skills (Larew et al. 2006). This, however, depended on the ability of staff to teach the students as they had limited education themselves regarding teaching clinical skills and based their teaching on past experiences (Simons et al. 1998). Apprenticeship training does, however, offer the trainee exposure to '*real life*' conditions and treatments (DeVita 2007). A disadvantage of the apprenticeship system was the lack of underlying

evidence based practice used to support clinical skills teaching and learning (MacKenzie 2009).

Clinical skills education is a core element of nursing education, nationally and internationally. The teaching and learning of clinical skills in Ireland is guided by An Bord Altranais (Irish Nursing Board) and educators facilitate such learning in a multimodal way. This multimodal approach involves the use of clinical skills laboratories, computer assisted learning (CAL), use of audio-visual (AV) equipment, e-learning, didactic teaching and demonstration (Love et al. 1989; Jeffries et al. 2002; Bloomfield et al. 2008; Bloomfield et al. 2013). In contrast to Ireland, the UK Nursing and Midwifery Council (NMC) clearly outline essential skills clusters to guide educational and clinical staff (NMC 2010).

The literature suggests that the most common approach to teaching clinical skills has been the didactic approach where the lecturer provides the theory in relation to the skill followed by a demonstration of the skill to a large group of students (Jeffries et al. 2002; Khan et al. 2012). Didactic teaching and demonstration may leave a void in relation to the cognitive and affective domains of learning, which collectively constitute competency in skill and theory acquisition. The didactic approach is considered teacher focused and does not always accommodate the diverse learning styles or learning needs of the students (Khan et al. 2012). A lack of consistency in how the skills are demonstrated and a lack of consistency of the information provided by lecturers have been reported with use of the didactic approach (Corbally 2005).

Nurse educators are responsible for the teaching of clinical skills in Higher Education Institutes in clinical skills laboratories. This is then supported in the clinical area by qualified nurses who are trained preceptors / mentors. Clinical skills laboratories, often referred to as clinical laboratories or skills laboratories, are rooms that have been developed to simulate the real clinical environment and are dedicated to the teaching and learning of clinical skills (Nicol & Freeth 1998; Gaberson & Oermann 2007; Woolley & Jarvis 2007). Simulation is used in the clinical skills laboratories to facilitate the acquisition of core nursing skills, by means of various teaching and learning approaches (Houghton et al. 2012). Gaba (2007 p.127) defined simulation as a

technique used "*to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner*". The rationale of simulation is to replicate real patient scenarios where students can develop their problem solving and critical thinking skills in the context of teaching and learning (Schiavenato 2009). Simulation can assist students to reduce human error in practice placement and increase patient safety (Hogg et al. 2006; Ziv et al. 2007). Simulation can be described as low fidelity, for example, the teaching and learning of psychomotor skills and includes task trainers (Stayt 2011). Medium fidelity simulation offers increased realism and includes patient scenarios (Jeffries et al. 2002). High fidelity simulation produces the most realistic clinical experiences with computerized high fidelity simulation mannequins, for example, SIM Man® and Rescussi Anne™ (Alinier et al. 2006).

There is increased public concern in relation to how prepared undergraduate nurses are to practice competently once qualified, principally articulated in, but not confined to, the UK (NMC 2005; The Patients Association 2009; Wells & Norman 2009). These concerns are being raised in Ireland currently with specific reference to whether current models of nurse education are sustainable to meet the needs of the Irish population in the future (Behan et al. 2009; HSE 2009). More specifically, concerns have been raised regarding the students' abilities in relation to drug calculations and medication management (Warburton & Kahn 2007; HSE 2009; Wright 2012), poor engagement with evidence based practice (Thompson et al. 2002; Caldwell et al. 2007) and the assessment of clinical competence (ABA 2005).

Hope et al. (2011) proposed that the profession of nursing needs practitioners with the requisite knowledge, abilities and work behaviours to meet the current health demands of the population. Educators are, therefore, challenged to prepare individuals who can deliver competent care and who have the ability to address future changes and acquire increasing technical abilities in the future (Ackermann 2009; Hope et al. 2011). The reported lack of continuity in teaching and learning clinical skills, the lack of engagement by students with clinical skills learning and a drive to engage in educational development have been the catalysts for this study.

In the past, active learner involvement has tended to be neglected in secondary education and in traditional universities (Denny et al. 2008). The use of traditional approaches to teaching has been directed to meeting the needs of two types of intelligence, namely logical-mathematical and linguistic intelligence or general intelligence (Gardner 1983). When educators teach for general intelligence, it is suggested they teach to students rather than facilitate learning with students (Gardner 1983). Nursing students, like all other students, have many varying learning needs and learning styles. This study explores one teaching and learning approach, namely, MITA, that facilitates all learners, regardless of ability, and encourages independent, self-directed and active uptake of knowledge in the skills laboratory, classroom and beyond. It is claimed that a MITA can help student nurses to learn with differing intellectual strengths, abilities or dispositions (Weber 2005).

This study provides an opportunity to contribute to and develop the professional practice of teaching and learning clinical skills in the clinical skills laboratory. The study, using a RCT, is an attempt to address this gap in the evidence base relating to teaching and learning in the clinical skills laboratory. The study findings can provide nursing colleagues with knowledge in relation to a method of teaching, namely, MITA, that can actively engage the student in their learning by viewing nursing students from a different perspective and perceiving them as being "*smart in a number of ways*" (Moran et al. 2006).

1.5 Organisation and content of the thesis

This thesis is presented in six chapters. Following this introduction chapter, Chapter Two presents a review of the literature that gives a background to skill development and the theories and models associated with skills development. This chapter also presents literature pertaining to learning styles, multiple intelligences theory and multiple intelligences teaching approach.

Chapter Three presents the research aims and objectives employed in this study and progresses to give a detailed account of the research methods used. This study

employed an experimental design using a RCT. The data collection instruments and data analysis strategies are clearly described.

The results of the study are presented in Chapter Four and a critical discussion of the results is presented in Chapter Five addressing the aims and objectives of the study. The results are interpreted in the context of existing nursing literature. The implications of the study for nursing education are also discussed.

Finally, Chapter Six presents the main conclusions from the study. Recommendations for the future practice of skills laboratory teaching, education and research are also identified.

Chapter 2 - Literature review

Introduction

An essential part of learning to be a nurse is the acquisition of clinical nursing skills and the relevant knowledge underpinning the enactment of those skills (Higgins et al. 2010). While there are many views about how clinical skills should be taught (Jeffries et al. 2002; Freeth & Fry 2005; Wellard et al. 2009; Stayt & Merriman 2012), there remains little consensus on the most appropriate method for teaching such skills. This chapter aims to contextualise the study by reviewing the literature related to skill development and approaches used for teaching and learning clinical skills. The concluding section of this chapter presents a discussion on learning styles, multiple intelligences theory and multiple intelligences teaching approach.

2.1 Literature searching strategy

The search for the literature review took place in three stages. Stage one explored the current state of the literature in relation to clinical skills learning and teaching. A range of subject headings and free-text keywords were used to identify as many relevant papers as possible (Appendix 2). This allowed for the detection of any gaps in current knowledge. Figure 2.1 identifies how the review process took place. The Consort Guidelines (2010) provided guidance for reporting experimental studies; the Strobe Guidelines (von Elm et al. 2008) provided guidance for observational studies and the COREQ Guidelines (Tong et al. 2007) provided guidance for studies that used qualitative research interviews and focus groups. Data were extracted regarding study design and sample, instruments and data collected and findings. A table of studies that met the inclusion criteria for clinical skills learning and teaching is included in Appendix 2.

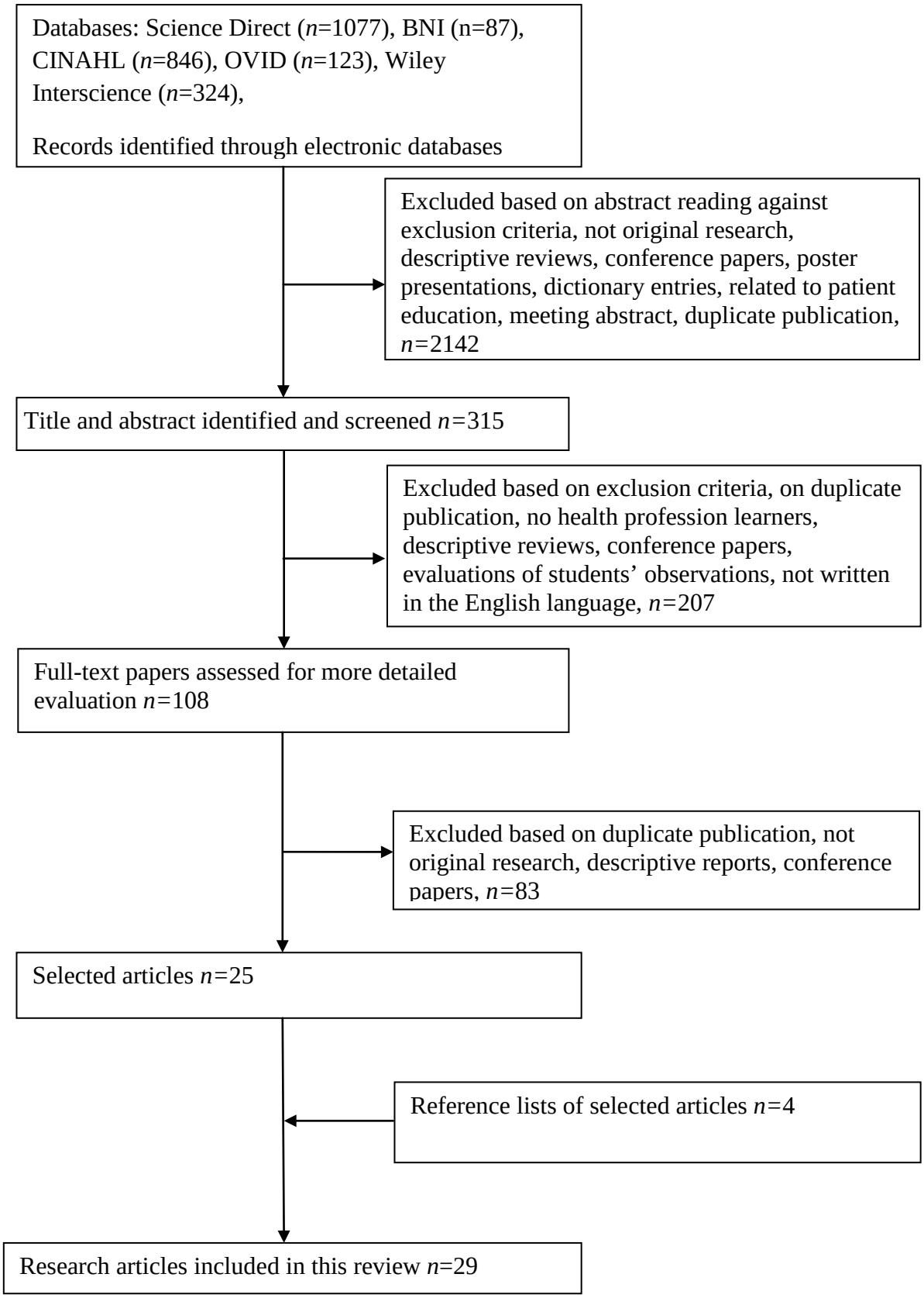
Stage two of the literature review explored the literature in relation to learning styles and its impact on learning and knowledge retention (Appendix 3). A list of key search terms is included in Appendix 4. Stage three of the literature review explored the literature in

relation to multiple intelligences theory and the impact of multiple intelligences theory for learning and teaching (Appendix 5). A list of key search terms is included in Appendix 6.

Searching for research evidence was undertaken using a number of different sources that included searching five electronic databases which included 'Science Direct', the 'Cumulative Index to Nurse and Allied Health Literature' (CINAHL); 'OVID'; the 'British Nurse Index' (BNI) and 'Wiley Interscience'. It was important to make a decision early in the process about the coverage of the literature in terms of language and time span. Initially, only those studies published between 1994 and 2013 were included for clinical skills teaching and learning because from 1994 onwards nurse education in Ireland underwent substantial changes. The investigator used discretion if an older study was found that was thought to be relevant. Due to language, time and cost constraints it was decided to only use material that was published in English. Inclusion and exclusion criteria were used to keep the search focused (Appendix 7).

This strategy was supplemented by searching other literature sources which included text books that were specific to the topic belonging to the libraries of An Bord Altranais, King's College London and Waterford Institute of Technology. Primary sources were also identified through the reference lists of selected articles. Regular searching of the literature took place to identify any new articles as they were published.

Figure 2.1: Stage 1 Literature search for clinical skills learning and teaching



2.2 Defining clinical skills in nursing

Skill and skill development is a complex issue in nursing. '*Skill*' can be defined as a level of performance or a level of expertise (Farley & Hendry 1997; p.46). Bachmann (1990) has argued that '*skill*' involves forethought as to the outcomes to be achieved and suggested that skill is more than simply a task, as it brings together elements of theory and practice. The international literature proposes a number of nomenclatures for skills in nursing (Casey et al. 2004; Berkowet et al. 2009; Hickey 2009; DeBourgh 2011). These include use of the words '*motor skill', 'psychomotor skill, 'affective skill', 'clinical skill'* and '*practical nursing skills'*.

The principal components of skill should include, psychomotor, affective and cognitive ability and these sub-categories should be synthesised to form a comprehensible model of what constitutes competency (DeBourgh 2011). On its own, the term motor skill can be conceptualised in two ways. First, a skill can be considered a task to be carried out, suggesting dexterity and mastery (Ong et al. 2010). Second, skill can be viewed as a level of performance proficiency that differentiates those who perform skills at a higher level from those who perform skills at a lower level (Fisher & Kielhofner 2005; Ong et al. 2010). However, this technical and limited definition merely identifies a motor skill as a task to be completed and suggests that performance is the most important element (Bjørk & Kirkevold 1999).

The term psychomotor skill has been used extensively in the literature, suggesting that there are a number of elements involved in each skill, in particular cognitive function and physical movement (Oermann 1990; Bjørk 1997). In essence, the term psychomotor places an emphasis on '*doing*' the skill without necessarily '*knowing how*' to do the skill (Chapelhow et al. 2005). Three types of psychomotor skills have been identified and include fine, manual and gross (Reilly & Oermann1990). Fine motor skills are described as those skills required for tasks that require precision, for example, preparing and administering an injection or removing sutures (Quinn 2007). Manual skills relate to those skills that require manipulation and possibly repetition (Gomez & Gomez 1987). Examples include the application of bandages or assisting a person with their personal

hygiene needs. Gross motor skills include the large muscle groups and need increasing movement, for example, helping to turn a patient or making a bed (Quinn 2007).

The cognitive element of clinical skills development refers to the knowledge, intellectual abilities and the processes necessary to perform the clinical skill (Saididen & Kneebone 2012). Students can evidence different levels of learning and achievement at the cognitive stage of learning clinical skills. According to Kneebone et al. (2002) the three domains of learning (namely, psychomotor, affective, cognitive) are all required for successful interaction with the patients in the clinical area despite the fact that they are usually taught separately.

In nursing, Staib (2003) argued that the affective element of skill development should have the same value as the psychomotor and cognitive elements. According to Brown (2011) the caring and ethical practice of nurses is an integral part of nursing care. The nurse needs be aware of the affective element, or 'caring attitude', and interpersonal skills required to carry out a skill because of the need to deliver quality care. Beattie (2006) further emphasised the need to develop beliefs, values and attitudes among nursing students that match professional purpose in the acquisition of clinical skills.

Bradley (2002) defined a clinical skill as any action undertaken by a healthcare professional aimed at bringing about an improvement in patient outcome. It is suggested this type of definition has a broader context than previous definitions of clinical skills and allows the outcome of the skill, as it relates to the patient, to be identified. An example in nursing education could be in the preparation of skills simulations by teaching staff. Using the three domains that constitute competency in clinical skills (psychomotor, cognitive, affective) and incorporating other elements of the curriculum, it is then possible to encourage nursing students to consider the impact for the patient, thereby, encouraging skills learning. The assessment of clinical skills informs the nurse of the level of competence achieved by the student and this can be conducted using an objective structured clinical examination (OSCE) process.

2.3 Clinical competence and competency in nursing

Competence can be defined as "*the ability to perform the task with desirable outcomes under the varied circumstances of the real world*" (Benner, 1982, p. 304). Benner (1982) further suggested that competence was a progressive process achieved with experience. This definition must, however, be taken in the context that Benner's (1982) model was developed using the apprenticeship system of education. The contemporary post technocratic model of competency is defined by the Irish Nursing Board as "…*the ability of the Registered Nurse to practice safely and effectively, fulfilling his/her professional responsibility within his/her scope of practice*" (An Bord Altranais 2005, p.12). This definition suggests that nursing is complex and multifaceted and, consequently, competence is the ability to perform effectively whilst promoting high standards of professional conduct in nursing.

It is argued that a distinction needs to be made between the terms competence and competency as it is suggested that both terms are used inconsistently and interchangeably (Manley & Garbett 2000; Higgins et al. 2010). Competence is considered to be job related and is the ability of an individual to perform a job while demonstrating an outcome of performance; essentially it is about how a person performs (Higgins et al. 2010). Competency, in contrast, is focused on the individual person, referring to the qualities, behaviour and characteristics of the individual, while performing a role in a given situation and involves psychomotor, cognitive and affective ability to perform in practice (McMullan et al. 2003).

Watson (2002) suggested that competency in nursing education should not be ignored as competency is considered an appropriate strategy in the teaching and assessment of student performance internationally. Watson (2002) was, however, critical of the fact that competence and competency remain so poorly defined and suggested that competence has been identified as "…*often no more than not being incompetent*?" (p.477).

2.3.1 Objective structured clinical examination

The assessment of clinical skills and clinical competence has become an essential element in nursing in recent years because of the need to know that students are safe and competent practitioners at the point of registration (Alinier 2003; An Bord Altranais 2005; Jones et al. 2010). The Objective Structured Clinical Examination (OSCE) has become accepted as the benchmark for assessing clinical skills competency in nursing education (Bartfay 2004; Mitchell et al. 2008). This is predicated on Miller's (1990) pyramid, a theoretical model that demonstrates the "*shows how*" or "*performance*" of skills. An OSCE can be described as "*an examination where students demonstrate their competence [in the performance of clinical skills] under a variety of simulated conditions*" (Watson et al. 2002, p.242). Attention is also paid to assessor objectivity and parity (Mitchell et al. 2009).

The OSCE typically comprises a circuit or series of stations using short assessment tasks that are assessed by an examiner using predetermined objective marking criteria (Bartfay et al. 2004; Byrne et al. 2007). There is no consensus in relation to the number of stations an OSCE should comprise. Originally 16 to 20 stations were suggested (Harden et al. 1975), however, this number varies according to different authors. For example, one to eight stations has been suggested by Anderson & Stickley (2002) while Brosnan et al. (2006) refer to multiple station examinations without offering a specific number. During an OSCE the student is required to demonstrate a specific set of skills, behaviours and attitudes in a simulated environment under structured, standardised conditions within a specific timeframe (Harden & Harden 2003). Pioneered by the medical profession in 1975, the OSCE has since been employed by many other health care professions, such as nursing, dentistry and physiotherapy, to assess clinical skills acquisition (Harden et al. 1975).

Nursing has adapted the original format of the OSCE and as a result may have implications for validity and reliability of this assessment approach (Rushforth 2007). To prevent such problems nurse educators need to consider the design of the assessment

schedule as well as the quality of the student tasks presented at the stations (Rushforth 2007). As each new OSCE is developed it should be piloted prior to use and the OSCEs should be evaluated rigorously (Mitchell et al. 2009). Furthermore, Mitchell et al. (2009) argued that if the OSCE is used to measure student competence and not merely performance, professional behaviour and the students' ability to integrate skills then this can address concerns in relation to validity and reliability. This can be done by testing a wide range of skills using a number of assessors which leads to increased assessor objectivity and consistency.

Validity of assessment refers to how well an assessment measures what it is supposed to measure. Reliability of assessment relates to the probability that if the assessment is repeated under stated conditions for a period of time that it will do so repeatedly (Quinn & Hughes 2007). Validity of the OSCE can be increased by assessing a wide range of skills and competencies, by using a large number of examiners, maximising assessor objectivity with pre-determined checklists and / or global rating scales and by assessing students on the same skills (Khattab & Rawlings 2001; Rushforth 2007; Selim et al. 2012). Identifying the learning outcomes and competencies to be assessed early in the process when developing OSCEs, is another way of helping to increase the validity of the OSCE process (Newble 2004; Barman 2005; Nulty et al. 2011). The identification of the skills that the student needs to be competent in informs the decisions in relation to the necessary skills to be undertaken at the OSCE stations at the correct level of competency.

It can be argued that the reliability of the OSCE can be improved in a number of ways. This includes the use of standardisation and objectivity (Bartfay et al. 2004). One way of improving objectivity is by having predetermined assessment checklists that include elements of a global rating scale (Barman 2005; Byrne & Smyth 2007). Reliability of the OSCE can be further strengthened by having a good design of the assessment schedule, by having a large number of stations, by being combined with other methods of assessment, by appropriate training of the examiners as well as appropriate training for the simulated patients if used (Nicol & Freeth 1998; Barman 2005; Rushforth 2007).

Using a simulated environment with the use of mannequins may also strengthen reliability of the OSCE because consistency, parity and less subjectivity with the OSCE assessment method can be achieved for each student in a controlled environment (Brosnan et al. 2006). Furthermore, the use of a written station has led to an improvement in the reliability of the OSCE (Verhoeven et al. 2001; Kramer et al. 2002; Brosnan et al. 2006). It is thought that when the theory and knowledge underpinning clinical skills are assessed in combination with the psychomotor element then a synthesis of the two forms of knowledge can take place. When the OSCEs were originally developed this is what Harden and Gleeson (1979) had intended. Good planning and administration of OSCEs is essential when trying to overcome some of the challenges related to reliability, validity, objectivity and cost (Barman 2005).

Preparation for the OSCE examination should include a process of checks and feedback (Bartfay et al. 2003; Bloomfield et al. 2010). When students are made aware of the marking criteria in advance of the OSCE process then learning has been enhanced because students can prepare in advance and this has also been found to reduce stress levels (Byrne & Smyth 2007). The potential drawbacks of this, however, may be rote learning of the skills to be examined and that the student may not necessarily understand the skill. Feedback has been identified as essential for helping students to focus attention on important aspects required for learning but this needs to be given in a timely and meaningful fashion (Childs & Sepples 2006; Nicol 2006; Smits et al. 2009; Gibbs 2010, Nulty et al. 2010). A discussion or a debriefing after the OSCE may help to focus the student on their learning and clinical competence (Alinier 2003; Nulty et al. 2011). Time constraints and large numbers of students rotating through the OSCE stations can lead to poor or no feedback being given to the students (Selim et al. 2012). Having extra time built into the OSCE process to provide valuable feedback to the student should perhaps be considered if student learning and clinical competencies are to be enhanced (Eldarir et al. 2010). This, however, may prove difficult due to cost and time constraints (Selim et al. 2012). A further way to support students in their learning is to provide practice sessions prior to the OSCE examination. At this practice session

feedback to the students in relation to their strengths and weaknesses and areas where performance can be improved is suggested (Ramsden 2003; Nulty et al. 2011).

One of the main weaknesses of the OSCE is their resource intensiveness, in relation to cost and the number of personnel required (Barman 2005; Brosnan et al. 2006; Mitchell et al. 2009; Palese et al. 2012). Using an OSCE as a method of assessment has, however, been shown to outweigh the running costs involved because it offers parity for all students and promotes increased assessor objectivity (Khattab & Rawlings 2001; Rushforth 2007; Palese et al. 2012). A further concern regarding the use of OSCE is the stress experienced by students which in turn can affect performance (Bartfay et al. 2004; Rushfort 2006; Byrne & Smyth 2008). This may be overcome by adequate student preparation, practice sessions in advance of the OSCE and staff preparation (Brosnan et al. 2006). Despite this the OSCE is comparable with how students would have to perform in the clinical environment (Bartfay et al. 2004). In studies that used OSCEs as an assessment method, students have identified that their confidence levels, their motivation and their preparedness for working in the clinical areas have increased following the use of an OSCE (Alinier 2003; Brosnan et al. 2006; Barry et al. 2012). This may be a result of the preparation and practice required prior to the OSCE and this may facilitate experiential learning.

2.4 Theories underpinning skills development

The theories underpinning skills development have been influenced by the sciences (sports and exercise science) and are concerned mainly with task development, task accomplishment and acquisition (Williams & Hodges 2004; Davids et al. 2008; Farrow et al. 2008). In addition, Davids et al. (2008) argued that skills vary in their level of complexity and developing skills requires an element of practice, depending on the complexity involved. Bond et al. (2007) suggested this is similar in the field of nursing as skills vary in complexity and repeated practice develops proficiency. Two main distinctions can, however, be made in relation to feedback and theories of skill acquisition. Firstly, repeated practice leads to skill refinement. Secondly, it is

suggested that repeated practice leads to greater knowledge and understanding of the skill and this in turn leads to improved skills performance because when the skill is understood then knowledge transfer can take place (Dall'Alba & Sandberg 2006). In order for an individual to develop and progress with their skill development and acquisition, feedback should be provided and this can be achieved by an external source or person or through self-monitoring. In addition, Bond et al. (2007) also argued that feedback is required to increase skill knowledge and improvement which supports Davids et al's. (2008) contention of skill complexity.

The views of behavioural psychologists such as Skinner, Pavlov and Thorndike have significantly influenced the literature on skills development (Emerson 2007). Behavioural theorists believe that the learning process is straightforward and that thought processes are formed as a result of stimulus – response activities (Davids et al. 2008). Behaviourism, a theory that is based on purely observable phenomena, suggests that the learner is essentially a passive learner and responds to environmental stimuli where behaviour is shaped by either positive or negative reinforcement and punishment (as defined in behaviourism) (Race 2005). In relation to skills learning, the behaviourist school recognises the importance of drill, practice, memorisation (that is reinforced) and feedback, albeit positive or negative, and that learning occurs with resultant change in behaviour (De Young 2003).

In essence, behaviourism is still used in nursing education today as nursing skills are generally taught by the educator or the registered nurse (De Young 2003). In the behaviourist approach, each step of the clinical skill is broken down into a series of steps (task analysis) to help focus the nursing student on the learning outcomes to be achieved (West et al. 2007). In nursing the educator / nurse usually provides the reinforcement for the nursing skill being learned. For example, resuscitation training using the behaviourist approach entails practising a sequence of steps in order to achieve a specific outcome and each step is positively reinforced. Madden (2006) agreed with the behaviourist approach as students benefit from positive feedback during or after the demonstration of the resuscitation skills.

However, a number of criticisms have been levelled at the behaviourist approach, which include that it is a teacher-centred model; it lacks flexibility; it does not recognise individual learning styles of the students and it neglects higher level functions such as problem solving (conative factors) (Vandaveer &Norton 2005; McIntosh et al. 2011).

Therefore, the conclusions from this section focus on the fact there is no predominant theoretical view of motor skill acquisition in the nursing literature (Emerson 2007). Procedural knowledge, grounded in behavioural learning theories, is an understanding of knowledge that is specific to a discipline (Anderson et al. 2001). From a nursing perspective, procedural knowledge comprises the skills, techniques and methods used by the nursing discipline, while also taking into account when and where to use such skills (Emerson 2007). In order to achieve mastery at skill level, Emerson (2007) suggested that two necessary requirements are factual knowledge and conceptual knowledge. Consensus does exist on the models underpinning skill development, which will be discussed in the next section.

2.5 Models underpinning skill development

A model of skill development, initiated by Fitts and Posner (1967), who identified a three stage model of motor skill development, has been used in the context of nursing and medical education. The three phases include the cognitive phase, the associative phase and the autonomous phase and these phases should be considered as part of a continuum of practice (Fitts & Posner 1967). This model is still considered applicable in contemporary practice as it relates to the understanding of motor skill development for nursing since it informs the '*how*' of skills acquisition.

The cognitive phase is when the learner is exposed to simple rules along with verbal instructions and starts with '*what needs to be done'*. During the cognitive phase the learner obtains a basic understanding of the movements necessary to carry out the specific skill while gaining an overall picture of what is required. The learner has the potential to make many errors in the cognitive phase and is considered to be consciously incompetent (Schmidt & Wrisberg 2004).

Phase two, the associative phase, occurs when the learner has developed the '*what, how and when*' of carrying out the skill. This phase depends on the complexity of the skill while also taking into account the learner's abilities. Different lengths of practice may be required in this phase to learn the skill. The associative phase involves the use of feedback, external and internal, to perfect the skill. The learner also has the potential to give internal feedback as they develop kinaesthetic awareness of the movement involved with the skill (Chang et al. 2011). In the associative phase the learner is considered to be consciously competent.

The third phase, the autonomous phase, is when the learner can perform the skill with minimal mental effort and makes very few errors. Since the learner has had much practice for this phase, the skill can be performed effortlessly. External feedback is necessary in this phase to help the learner develop the acceptable points of the skill. To maintain this level of skill development, the learner must continue to engage with persistent practice and should also be motivated to progress towards a level of skill expertise (Ericsson 2004; Kneebone 2005). The learner is considered to be unconsciously competent in the autonomous phase (McGill 2007).

As part of the autonomous phase, deliberate practice is considered essential for the development and mastery of clinical skills (Ericsson 2004). In the autonomous phase, the basic skills can be developed to an automated level, for example, in the clinical skills laboratory. This means that the nursing student should then be able to focus on more complex issues when they are working in the clinical area (Kneebone et al. 2002, Aggarawal et al. 2007). Therefore, it is important that the nursing student possesses the knowledge and theory of clinical skills prior to performing skills on their own in the clinical environment (Van Herzeele et al. 2008). The student can generalise experiential learning and apply knowledge to any new situations encountered. Bjørk (1997) and Freeth and Fry (2005) argued, however, that environmental and contextual influences and patient factors must be contemplated for this to happen successfully. The goal of the autonomous phase is to enable students transfer the knowledge gained in the simulated environment, such as the clinical skills laboratory, to the clinical area effortlessly.

Although Fitts and Posner's (1967) model has been incorporated into most information-processing models of skill learning, little research has been generated to test this model because of the generic descriptions used to describe each of the three phases (Williams & Hodges 2004). Furthermore, Reznick and MacCrae (2006) argued that nurses work in a constantly changing environment due to changes in patients' conditions and as a result students have to be able to adapt their skills to meet these needs. Therefore, Reznick and MacCrae (2006) suggested that students may not be able to achieve the autonomous phase fully unless they receive the necessary support and feedback from qualified staff. The theory by Fitts and Posner (1967) may, however, have relevance to the acquisition of clinical skills for nursing students because it clearly identifies three stages necessary for skill development.

Moreover, the work of Benner (1984) can also be linked closely to the work of Fitts and Posner (1967). Benner (1984) identified that movement through clinical skill acquisition comprised of three beliefs. The first belief relates to the use of past experiences and a move away from the '*notion of abstract principles*'. The first belief centres on the learner's requirements to understand the task to be undertaken, but this necessitates specific instruction and feedback from expert staff during the phase (Botti & Reeve 2003; Kneebone 2005). The second belief is a move towards seeing the situation as a whole as opposed to a set of elements, similar to the associative phase of Fitts and Posner (1967), where the learner has determined the most effective way to carry out the skill. Finally, Benner (1984) identified the movement of the learner from detachment to involvement in a given clinical situation. In this regard it is judged that the learner can work independently using intuitive behaviour similar to the autonomous phase of Fitts and Posner (1967).

In a seminal piece of work, which adopted a behaviourist approach, Gomez and Gomez (1984) identified a model of skill acquisition developed by Gentile (1972). This model identifies two main stages that has relevance to skill acquisition in nursing. The goal for the learner in stage 1 is to develop an understanding of the skill to be completed and to identify the conditions that influence or do not influence skill performance. Stage 2, referred to as the fixation / diversification stage, involves the learner progressing to the

next stage only if they have successfully achieved stage 1. During the fixation stage the learner practices and refines the skill so that it can be reproduced identically each time. During the diversification stage the skill must be practiced in a changing environment so that the necessary modifications can take place and the learner strives to perform the skill with minimal effort as they endeavour to perfect consistency and continuity of the skill. Gomez and Gomez (1984) suggested that each skill can be practiced in the sequence identified or by breaking the skill down into its constituent parts and then laterally the skill is practised as a whole in order to enhance learning. Quinn (2007) and DeBourgh (2011) concurred with this task analysis approach to skill acquisition and the consequent uptake of knowledge.

Although Gomez and Gomez's (1984) model provides information on the different stages involved in skill acquisition, there are a number of limitations identified with this model. The limitations relate to the variability of the time needed for practice for the skill development and the fact the learner may reach a performance plateau which results in slow progress. Gentile (1972) and Gomez and Gomez (1984), however, have not offered suggestions of ways to improve this impasse.

Gomez and Gomez (1984) further discussed open and closed motor skills that were categorised according to their environments. An "*open*" skill was described as a skill that takes place when the environment is variable and requires information processing. Most skills in nursing are considered "*open*" skills as the '*regulatory*' conditions are constantly changing, for example, pulse variations of each patient (Quinn 2007). A "*closed*" skill, on the other hand, was described as a skill performed under stationary conditions and, therefore, the technique can be used repeatedly, for example, hand washing.

Most of the skills undertaken in nursing gravitate towards the open end of the continuum as opposed to the closed end. Therefore, learners need to be taught how changes in the environment will affect their performance. Gomez and Gomez (1984) further identified the need for repetition and frequency of practice when learning clinical skills. The authors, however, did not provide sufficient information regarding the research evidence to support their work. However, this could be related to when their work was carried out

in 1984. Furthermore, the reader is not informed as to how Gomez and Gomez (1984) validated and adapted this teaching model for practice. What has been recognised, however, as a positive teaching strategy, is the breaking down of the skill components into parts (task analysis) coupled with the need for repeated practice as identified by Broomfield (1996), Bjork and Kirkevold (1999) and Quinn (2007).

All three models discussed can be applied to the development of clinical nursing skills. These models can help promote procedural competence and prepare nursing students for entry to clinical practice who are "*fit for practise"*. Table 2.1 displays the three constituents of competency that is based on a synthesis of three models of skill development (Fitts & Posner 1967; Gentile 1972 and Benner 1984).

Table 2.1: Synthesis of the three models of skill development and acquiring competency in nursing

Constituents of competency	Fitts & Posner (1967)	Benner (1984)	Gomez & Gomez (1984)
Cognitive	**Phase 1:**Verbal - cognitive stage Identifies task goal Makes many errors Unable to determine cause of errors or correct them Attitude to instruction and knowledge commences	**First belief:** Uses past experiences, knowledge and skills to identify the goal. Needs to understand the task Beliefs on past experiences	**Stage 1: Getting the idea of the movement.** Identifies the goal to be achieved Learns to discriminate between regulatory and non-regulatory stimuli Develops a motor plan (Psychomotor) Develops an attitude towards instruction
Associative	**Phase 2:** Feedback Refinement Achieves consistency in carrying out the task and giving feedback on performance Requires varying lengths of practice Better at detecting cause of errors Confidence is developed Attitude to receiving feedback is developed	**Second belief:** Sees the situation as a whole Determines the most effective way to carry out the skill Attitude to modelling is developed	**Stage 2: Fixation / Diversification** Selective attention Adapting Appropriate boy position Practice / Repetition Feedback Refinement Consistency Cognitive Attitude to receiving feedback is developed
Autonomous	**Phase 3:**Minimum mental effort and few errors Movement is controlled automatically Requires extensive practice Consistency with skill performance	**Third belief:** Works independently Uses intuitive behaviour	Decision for the next response can then be made Continues with the plan Internalises the skill into long-term memory

All the models (Fitts & Posner 1967; Gentile 1972; Benner 1984) have important contributions to make to skill acquisition and development and importantly what constitutes competency in nursing. These models view skill development as a gradual accrual of a specific set of knowledge and skills and lay the foundation for the development of competency based clinical nursing skills and the preparation of nursing students for clinical practice.

2.6 Preparation of nursing students for clinical practice

For many years the focus of nursing has been on the development of practical skills, often referred to as the "*art of nursing*" (Bjork 1997) and is considered an essential part of the undergraduate nursing programme (Wellard et al. 2009). Freeth and Fry (2005) further argued that the preparation of nurses for safe practice in clinical areas must be underpinned by nursing knowledge and science. It is claimed that the knowledge and practice gained in pre-registration nursing programmes will be transferred to clinical practice facilitating what is referred to as a competent practitioner (Raines & Lynn 2010; Stayt & Merriman 2012).

The preparation of nursing students for clinical practice is fraught with issues including decreased exposure to teaching in the clinical areas (Nehring & Lashley 2009), the higher patient acuity levels (McKenna & Wellard 2004), approaches to teaching and learning of clinical skills (Wellard et al. 2009), less numbers of qualified staff to preceptor and help develop nursing students' skills in the clinical areas (Billings & Halstead 2005); the transition to third level education (Freeth & Fry 2005), clinical competence at registration (Stayt & Merriman 2012) and the transferability of skills taught in the skills laboratory to clinical practice (Ballie & Cuzio 2009). In addition, patients go home sooner from hospital to be cared for in the community due to resource constraints which leaves less time for students to develop their clinical skills (Freeth & Fry 2005). Due to the current restructuring of health services, a transient workforce and rapid technological advancements, it is argued that developing clinical skills in the

clinical area with nursing students can be difficult (Alinier et al. 2006; McCallum 2007; Borneuf & Haigh 2010).

Taking the above issues into consideration, it is suggested that an innovative mode for the teaching and learning of clinical skills is required for the development of confidence and competence of nursing students, without causing detriment to the quality of education. This can take place effectively in the clinical skills laboratory.

2.7 Clinical skills and laboratory simulation

Nursing is said to be an art and a science that is dependent on theory to inform clinical skills and then practice to be able to perform clinical skills (Chambers Clark 2008). Until recently clinical skills were taught in the clinical areas using the apprenticeship model of training (Simons et al. 1998). However, this approach to training was not always consistent and depended on a number of factors for it to take place, such as, staff development, staff interest in teaching and workload in the clinical area (Bradshaw & Merriman 2008). Recent years have witnessed a development and growth in learning clinical skills in clinical skills laboratories through the use of simulation (Jeffries et al. 2002; Morgan 2006; Wellard et al. 2009).

The clinical skills laboratory (CSL) can provide a safe environment where students learn and practice their clinical skills (Freeth & Fry 2005). Advantages of the CSL include; increased time for practice (Woolley & Jarvis 2007), improved safety for students and patients (Gaberson & Oermann 2007; Houghton et al. 2012), reduced anxiety for the student (Peterson & Bechtel 2000), increased skill confidence and proficiency in the clinical area (Hilton & Pollard 2005) and positive experiences of self-directed learning (Jeffries et al. 2002). Conversely, barriers to successful use of CSLs include; investment costs for qualified staff, equipment and technology (Wellard et al. 2009), appropriate supervision (Issenberg et al. 2005) and a mismatch between resources and the curriculum (Wellard et al. 2009).

Clinical skills learning also takes place in conjunction with the clinical experience learning during practice placement. While the simulated environment is recognised as a

safe way to learn and practice clinical skills, it must be recognised that this method of learning clinical skills cannot replace clinical experience but can certainly enhance it (Kneebone 1999; Jeffries et al. 2002; Morgan 2006). Koerner (2003) claimed that if students do not have somewhere safe to prepare and practice their skills in advance of clinical placement, they will spend time trying to learn how to do the skill in the clinical area and, consequently, this may cause a threat to patient safety.

In order to investigate the role clinical skills laboratories played in preparing nursing students for clinical placement, Houghton et al. (2012) carried out a qualitative multiple case-study design in Ireland with academic staff, clinical staff and nursing students (n=58) to explore if there was a connection between laboratory skills learning and preparation for practice. Houghton et al. (2012) found that authenticity in the clinical skills laboratories was important to facilitate a clear pathway to clinical practice. Even though the students said that the mannequins in the clinical skills laboratories were appropriate for simulation, a number of students reported that they could not supplant the real life experience and, consequently, this interfered with their learning. Houghton et al. (2012) suggested the need for more appropriate use of audio visual equipment to encourage reflective practice and the critical thinking skills of the student, necessary for evaluating clinical practice. Other results found that effective links between higher education and the clinical settings needed to be maintained to maximise student learning. Assessment methods for clinical skills learning, such as the Objective Structured Clinical Examination (OSCE), were found to be an appropriate form of assessment for clinical skills. The students reported that the OSCEs helped them to develop confidence in clinical skills performance.

A limitation of this study is that, while Houghton et al. (2012) identified the need for appropriate teaching approaches, they only alluded to the use of mannequins as a learning and teaching strategy. Furthermore, Houghton et al. (2012) did not discuss specific teaching approaches that may have informed the pathway to clinical practice.

2.8 Clinical skills teaching strategies

Teaching has been defined in a number of ways. Teaching can mean imparting knowledge or skill which results in learning, with this view of learning based on transmission (Biggs 2003). However, the main drawback with this interpretation of teaching is that it implies that learning is the responsibility of the teacher. It is argued that teaching at tertiary level is more than imparting knowledge or skill. In nursing, Jacobson (1966) identified six categories of effective teaching, namely; professional competence, interpersonal relationships, teaching practices, personal characteristics, evaluation practices and availability to students. These categories recognise teaching as supporting and facilitating student learning and this is an area of teaching the researcher wanted to explore more fully for the teaching of clinical skills.

Learning is concerned with gaining new knowledge, skills or behaviours (Biggs 2003). It is argued that this simplistic explanation of learning does not take into account why some people learn better than others, what individual learning preferences are when it comes to learning or the person's motivation for learning. The use of a MITA (Weber 2005) in the current study was considered one method that might help the nursing students learn their clinical skills, because it supported a diverse approach to teaching and learning and is a departure from the conventional methods of facilitating teaching in the skills laboratory.

The literature is replete with discussions on the best way to teach clinical skills to undergraduate nursing students (Alinier 2003; Freeth & Fry 2005; Hall 2006; Moule et al. 2008; Murray et al. 2008; Wellard et al. 2009). The teaching and learning of clinical skills includes the use of theory to inform the skill and then practice to be able to perform the skill (Chambers Clark 2008). As previously identified, one of the environments considered for teaching the clinical skills in recent years is the clinical skills laboratories (Houghton et al. 2012). The learning of clinical skills is also reliant on clinical placement for practice, supervision and feedback (Stayt & Merriman 2012). However, it has been reported that students are sometimes unable to transfer the knowledge that they gain in the clinical skills laboratories into the clinical environment

and this remains a concern for educators and clinicians (Murray et al. 2008; Wellard et al. 2009).

A number of different teaching approaches for clinical skills have been used such as demonstrations, simulation that is high or low fidelity, computer assisted learning (CAL), e learning, patient simulations, group seminars, role play and a combination of any of these (Murray et al. 2008; Bloomfield at al. 2010; Gunberg 2011). Two competing strategies for teaching psychomotor skills have been debated in the literature; namely, didactic instruction with lecture, demonstration and practice time (Salyers 2007) or a self-directed approach using technology and media (Jeffries et al. 2003; Bloomfield at al. 2010).

Salyers (2007) conducted a quasi-experimental study in the USA to ascertain the effects of two instructional approaches, traditional and web-enhanced learning, for clinical skills acquisition. All students (n=36) attended a three hour skills session. Students assigned to the control group (n=14) had a traditional lecture followed by a demonstration and then practice in each three hour session. Students assigned to the experimental group (n=22) had a web-enhanced approach for learning clinical skills and this meant that they had increased time for practising because the time in the laboratory was merely for practising the skill. The students assigned to the experimental group were provided with the same course material but could access the material at their convenience. This material was a computer package that included computer assisted instruction, videos, reading material and out-of-class assignments.

Salyers (2007) found that the students in the experimental group achieved higher cognitive scores and performed better in the skills examination, but this was not statistically significant. However, Salyers (2007) also reported that the students in the experimental group were less satisfied with the web-enhanced approach than the students in the control group. A number of possible suggestions for this included technical problems and lack of knowledge in relation to web-enhanced technology. This study highlights that while technology is improving and students can learn at their own pace, the students preferred mode of learning may play a part in student satisfaction in relation to the use of technology as a strategy for learning. Understanding students'

intellectual dispositions and how they learn can help educators find methods of learning that match students' learning needs.

In a similar study in the UK, Bloomfield et al. (2010), compared the use of a conventional teaching approach and computer assisted learning (CAL) for the acquisition and retention of the skill of hand washing using a randomised controlled trial (n=231). All students were afforded equal time for the learning of the skill that was 90 minutes in duration. The students assigned to the control group (n=113) were taught the skill of hand washing by a small group of experienced staff on-campus and watched a DVD depicting the process of hand washing. Students assigned to the experimental group (n=118) were provided with a computer assisted learning package and worked independently through the hand washing information. The DVD for the skill of hand washing was embedded in the CAL module and the students could review this as often as they wanted.

The results for the hand washing knowledge test scores showed no differences between the control and the experimental group, but the score at Time 3 had improved for all participants. The hand washing skill performance scores were higher for the experimental group at Time 3 and this was statistically significant (p=0.02). There were no significant differences in hand washing knowledge and skill retention scores between the control and the experimental groups at the time points used in the study. Bloomfield et al. (2010) suggested that the higher scores achieved at Time 3 by the experimental group for hand washing skill performance scores may have resulted from their ability to self-direct their own learning experiences. Bloomfield et al. (2010) suggested that CAL is as effective as conventional approaches for teaching the skill of hand washing. The use of CAL, and in particular the area of multimedia for student learning, can be used effectively to support student learning and incorporates multiple intelligence preferences.

There is no evidence to suggest that one method of teaching is better than another for the teaching of clinical skills (Meehan-Andrews 2009). The ability to learn is, however, believed to be influenced by a number of educational factors, which will be discussed in the forthcoming sections.

2.9 Factors that influence skill acquisition and development in nursing practice

A number of factors have been identified that have influenced skill acquisition and skill development in nursing and these factors include deliberate practice (Ackerman 2010), feedback (extrinsic and intrinsic) (McMorris 2004; Jeffries 2005; Quinn & Hughes 2007), reflection (Shepherd et al. 2007) and supervision (Freeth & Fry 2005; Nehring & Lashley 2009).

2.9.1 Deliberate practice

Deliberate practice includes a number of key processes, such as an evaluation of the skill performance, learning from errors in a safe environment and critical reflection (Clapper & Kardong-Edgrong 2012). The clinical skills laboratory is considered a safe environment where students have the opportunity to learn and practice their clinical skills before encountering them in the clinical areas (Freeth & Fry 2005). Timely clinical practice exposure must accompany clinical learning so as to reinforce learning and thus prevent contamination of the experience. A number of factors in the clinical area may prevent repeated practice from taking place such as lack of time, space and availability of staff necessary to give constructive feedback (Clapper & Kardong-Edgrong 2012), poor communication between the educational and clinical staff (Ericsson 2008) and the infrequency of practice based scenarios, which is dependent on the particular type of clinical exposure (Ackerman 2009).

De Young (2003) suggested that practice and refinement of clinical skills is essential for the learner to reach an adequate level of skill proficiency, which relates to the autonomous phase of Fitts & Posner's (1967) model, previously discussed. During the deliberate practice process, the learner fixes the sequential order of movements required and the amount of time needed for practice. The amount of practice is dependent on the complexity of the skill (Andrews et al. 2006; Ericsson 2008; Nehring & Lashley 2009).

The suggestion that repeated practice is necessary for skill development is supported by Ackerman (2009) who carried out an experimental study comparing acquisition and

retention of cardio pulmonary resuscitation (CPR) skills with undergraduate nursing students (n=67) at an American university. The purpose of the study was to compare the effects of two teaching methods, namely conventional teaching approaches and the use of simulation, over a three month time frame. Pre-test examination knowledge of CPR for the control and experimental groups took place followed by CPR review for both groups. The experimental group were provided with simulator experience while the control group received none. Both the experimental and the control groups completed a post-test for acquisition of CPR knowledge and skills followed up with a re-test of the same three months later. The results of the post-test scores found that the experimental group demonstrated significantly higher scores (p=0.015) for acquisition of CPR knowledge. Ackerman (2009) further identified that students who carried out CPR in a real life situation had higher scores starting the study, which is consistent with Benner's (1984) competency framework.

Ackerman (2009) concluded that, when students were afforded the opportunity to have additional simulated practice, the acquisition and retention of CPR knowledge was improved. In addition, it was suggested that the simulated environment provided students with the opportunity to practice in a safe environment. While acknowledging the limitations of this study, Ackerman (2009) recognised that the sample for the retention phase was small (n=49) but, that frequency of training and different approaches to teaching should be considered for undergraduate nursing programmes if learning and retention of knowledge and skills is to take place.

In another American study, Oermann et al. (2012) conducted a randomised controlled trial with first year nursing students (n=606) to explore the effect of deliberate training for cardio-pulmonary resuscitation. Students in the experimental group had a six minute CPR practice session every month using a voice-activated mannequin. Students in the control group had no extra practice time. Results found that students in the experimental group had significant improvements in compression rate and depth, hand positioning and ventilation rate and volume.

This result supports the need for deliberate practice to improve skill retention. This result is important in light of the fact that the recommended time frame for re-training

for CPR is currently every two years (AHA 2010). Regular performance for skill proficiency is necessary and warrants that such training should take place in tandem with the provision of both constructive and appropriate feedback.

2.9.2 Student feedback post performance in the clinical skills laboratory

An important constituent of clinical skills teaching includes debriefing and feedback (Jeffries 2005). Intrinsic feedback comes from within the learner as they reflect on their own performance in relation to the learning outcomes (Clynes & Rafferty 2008). On the contrary, extrinsic feedback is usually provided by the educator, registered nurse or other significant person such as a patient who provides objective analysis of performance (Ballie & Curzio 2005). Rowntree (1987 p.27) has described feedback as the "*lifeblood of learning*". Feedback should be considered as an interactive process that gives the student a deeper insight into their performance and ways in which they can improve in the future or to inform the student where their performance is currently situated (Clynes & Rafferty 2008).

According to Raisler et al. (2003) feedback should be timely, specific and objective. Jerome (1995) described the feedback process as happening in four stages as shown in Table 2.2.

Table 2.2: The four stages of the feedback process (Jerome, 1995, p.7).

Stage 1:	Provide a description of current behaviours that you want to reinforce and re-direct to improve a situation;
Stage 2:	Identify specific situations where these behaviours have been observed;
Stage 3:	Describe impacts and consequences of the current behaviours;
Stage 4:	Identify alternative behaviours and actions that can be taken.

Kurz et al. (2008) carried out a quasi-experimental study investigating diagnostic reasoning skills of graduate nursing students receiving feedback (n=48), in one centre in the USA. Following a focused examination of a standardized patient (SP) nursing faculty completed a competency checklist that rated each student in four categories of patient assessment. The experimental group received feedback from the clinical instructors and from the SPs and as a result it is suggested they had a more realistic view of their assessment skills. While recognising the study limitations including: the range of experience between 2 and 30 years; self-evaluation of assessment skills took place retrospectively away from the busy clinical areas and the number of students who completed the study decreased in the experimental group (n=13) and in the control group (n=11). Kurz et al. (2008) recommended using SPs for developing assessment skills of students and for providing feedback is warranted. However, they noted that caution should be taken when training SPs and standardised training is required so that SPs are formally trained to give constructive feedback.

In another American study, Grant et al. (2009) found the need for feedback was further supported. Grant et al. (2009) conducted a quasi-experimental pilot study with nursing students (n=40) to evaluate the effect of videotape-facilitated human patient simulator (HPS) feedback. The study was conducted in a skills laboratory equipped with high-fidelity simulators and video debriefing equipment. Results demonstrated that there was no significant difference between the control and the experimental groups on total performance scores, however, the video intervention group had a higher mean score (M=9.09) than the control group mean score (M=8.44). Limitations of this study included the sample size, the limited time that students participated in practice sessions (4 hours) including both simulation and debriefing time and the use of two different people to debrief both groups. This study demonstrated that receiving feedback is, however, important for professional development and that video-facilitated feedback has the potential to increase clinical behaviour in students in a simulated environment.

These studies (Kurz et al. 2008; Grant et al. 2009) suggest that students should receive timely feedback on their clinical skill performance in order to develop their clinical practice and reinforce learning. Feedback should be given sensitively and in private

such that the confidence and competence levels of students are not adversely affected. However, feedback must not be confused with praise (Conn 2002; Myrick & Yonge 2002). Nonetheless, feedback can have negative consequences when it is late or when it becomes personal (Clynes & Rafferty 2008). Feedback can also be given through the use of reflection that will now be discussed.

2.9.3 Enhancing clinical skills learning using reflection

Developing and enhancing a knowledge base through the use of reflection is not a new concept in learning and can be traced back to the Ancient Greek philosophers (Johns 2009). Contemporary reflective practice can be traced to Dewey (1933, p.30), a philosopher and educator, who wrote "*we learn by doing and realising what came from what we did*". The '*doing*' refers to the person's experiences and the '*realising*' refers to the process. Reflection is a broad term that encompasses areas of personal reflection to critical reflection and in the development trajectory of learning (Boud et al. 1985; Raine & Lynn 2010).

Reflection not only refers to what is known about a subject area but also what is not known so that the learner can identify areas that require further development (Suhre & Harskamp 2001). When learners reflect on their work, it is suggested that an internal learning process is developed (Staun et al. 2010). This encourages personal understanding, development of self-awareness and critical analysis in an area of concern as well as promoting a link between theory and practice (Boyd & Fales 1983; Schunk & Ertmer 2000; Freshwater 2002; Jasper 2003; Butterworth et al. 2008). This suggests that a change in how the individual thinks takes place (Freshwater 2007). Ruth-Sadd (2003) suggested, however, that not all learners know how to reflect and they require assistance and support from educators to achieve this. Furthermore, Arguel and Jamat (2009) and Mayers (2001) suggested that a combination of reflection and visual aids can further enhance learning. It is thought that the use of visual media is more notable than the use of text or verbal communication. In addition, they suggest that visual imagery has lasting effects on learning, particularly in relation to recall of information and critical thinking ability.

To find out how nurses understand the use of reflection in clinical practice, Gustafsson and Fagerberg (2003) carried out a phenomenological study with Swedish registered nurses (n=4) using phenomenographic method. The results were categorised into three main themes and included reflection, nursing care situations and the associated consequences. The nurses considered reflection to be a conscious activity that helped them to develop and mature as a professional nurse. Gustafsson and Fagerberg (2003) suggested that reflection helps nurses to integrate theory with practice which improves quality patient care.

In another study, Hatelevik (2011) explored the relationship between reflection, practical skills and theoretical knowledge with third year nursing students (n=446) in two Norwegian universities. The study found that if students are to make connections between theoretical knowledge and practical skills they need to have the relevant knowledge to be able to draw on in the clinical setting. Hatelevik (2011) further suggested that reflective thinking should not be considered as a generic skill only but in combination with professional knowledge and practical experience. The purpose of reflection is to challenge how nursing care is delivered and ultimately make appropriate changes to improve patient care delivery. Reflection in nursing practice requires structured supervision by trained preceptors.

2.9.4 Supervision as a prerequisite in skills teaching

The supervision and support offered to nursing students when on clinical placement are key elements to ensuring student development in clinical skills (Mills et al. 2005). In nursing education in Ireland, students are allocated preceptors for their clinical placements (hospital and community). The role of the preceptor is to develop student confidence and competence and assist the student in their clinical skills development through appropriate supervision and timely constructive feedback on their performance (Corlett et al. 2003; NMC 2008; Stayt & Merriman 2012). Resistance to clinical supervision has been reported and is due to time constraints, release of staff for clinical supervision sessions and the perceived increased workload of the preceptor (Butterworth et al. 2008).

Stayt and Merriman (2012) evaluated the perceptions of UK nursing students (*n*=421) in relation to opportunities to practice skills, frequency of clinical skills practice and the level of supervision provided during clinical practice in one university. They used a cross-sectional survey design and online questionnaire. The results showed that the frequency and type of skills practised varied between students. Inconsistency with regards the level and types of supervision in the clinical area was reported. Stayt and Merriman (2012) suggested that some students were not assessed for competency level and were allowed to practice essential clinical skills without any nursing supervision. This happened more often when the clinical areas were busy and the priority was to complete patient care rather than support the nursing student. This is a concern for both the Higher Education Institutes and the clinical areas as it is anticipated that students should be considered fit for purpose and fit for practice at the end of their educational programme. If nursing students are not provided with appropriate supervision levels then their competency levels may not develop and patient care may become compromised.

Taking these factors (deliberate practice, feedback, reflection and supervision) into consideration is useful when planning clinical skills teaching but the learning style preferences of students should also be explored to further enhance learning.

2.10 Awareness of learning styles and knowledge acquisition

Learning style can be referred to the idea that people learn in different ways, respond differently to modes of instruction and are concerned with the processes of learning (Kolb 1985; Felder & Brent 2005; Zhang & Lambert 2008; Pashler et al. 2009). Others recognise that learning styles incorporate affective (personality, motivation, peer interaction), cognitive (problem-solving, perceiving thinking and remembering) and physiological (health, gender, reactions to physical environment) styles (Thompson & Crutchlow 1993; Coffield et al. 2004; Reid 2005; Astin et al. 2006).

From a nursing perspective and, at a time when nursing education is expensive and with increasing pressure on resources, educators must try to optimise learning opportunities

for all students (Rassol & Rawaf 2008). Students should be helped to identify their learning needs and to find ways that can meet their learning styles so that they can enhance their own learning (Fry et al. 2009). Educators should try to develop the capacity for students to learn and also increase their motivation to learn because when this takes place it is suggested that the students succeed and are prepared for lifelong learning, not only for their personal development but also in the workplace (Demos 2005).

When students are taught in an environment that attempts to match their learning styles, motivation, interest in the topic and relevance can all be improved, including educational outcomes (Lambert & McCoombs 2002; Astin et al. 2006; Green et al. 2006; Felicia & Pitt 2009). Learning styles can also foster meta-cognitive skills as learners become more aware of their personal learning also leading to improved learning outcomes (Sadler-Smith & Smith 2004; Pritchard 2009).

People have a tendency to prefer one single learning style over another (Felder & Spurlin 2005; Felicia & Pitt 2009). Educators should not label students because they demonstrate a particular learning style as this may lead to poor professional judgement (Reid 2005). Educators should try to encourage the students to develop their learning styles to help expand their personal ways of learning (Demos 2005; Reid 2005; Graf et al. 2007; Koch et al. 2011). An effective teacher needs to vary techniques of teaching and learning in the classroom to facilitate maximum learning. Learning must not be considered as a single event but as a process with a variety of various learning practices that enhance the capacity to learn (Demos 2005; Reid 2005; Fry et al. 2009). It is suggested that central to any learning is change in the learner themselves (Fry et al. 2009).

Much has been written about the implications of using learning styles for effective teaching; however, a difficulty that exists is how to measure learning styles in a reliable and valid way (Coffield et al. 2004; Felicia and Pitt 2009). It is suggested that one of the reasons for this is because of the multiple factors that influence learning such as cultural background, behaviour and the environment (Silverman & Wood 2004; Pashler et al. 2009). A further reason is that learning styles can evolve over time, which can

lead to inconsistencies into their measurement (Coffield et al. 2004; Rayner 2007). It is further argued that learning style advocates fail to recognise the students' aptitude / ability and confuse it with their style (preference) (Sparks 2006).

There are many tools available to measure a person's learning style. These tests are only tools and should not be seen as an end in themselves (Rayner 2007). Coffield et al. (2004) identified 71 models of learning styles and assigned these models into '*five families of learning styles*' (p.10) (See Table 2.3). Within each family, Coffield et al. (2004) identified the key beliefs, concepts and definitions about learning.

Table 2.3: Family of learning styles (adapted from Coffield et al., 2004, p.9)

Learning styles and preferences are largely constitutionally based including the 4 modalities.	Learning styles reflect deep-seated features of the cognitive structure including 'patterns of ability'.	Learning styles are one component of a relatively stable personality type.	Learning styles are flexibly stable learning preferences.	Move on from learning styles to learning approaches, strategies, orientations and conceptions of learning.
Examples include: VARK Dunn and Dunn	Examples include: Riding	Examples include: Myers-Briggs Jackson	Examples include: Index of learning Styles Kolb Honey and Mumford	Examples include: Entwhistle Vermunt

In an attempt to identify nursing students' learning style preferences, Rassool and Rawaf (2008) carried out an exploratory study in south-west London, UK, with a group of second year nursing students (n=110) undertaking the mental health branch of RN education. All students completed the learning style questionnaire (LSQ) (Honey & Mumford 2000) as a baseline assessment.

The results found that the learning style preference with the highest frequency, in the four category learning style preferences, was the reflector group (n=48; 43.61%) followed by the activist category (n=18; 16.10%). An additional "*dual*" learning style

category (n=33; 30%) was also identified and included the reflector-theorist learning styles group (48%) followed by the theorist-pragmatic learning styles group (18%). The results of the study by Rassool and Rawaf (2008) showed that the students' learning styles preferences had no impact on knowledge acquisition (p=0.07) or attitude change (p=0.71) but had a statistically significant influence on intervention confidence (p=0.002). Rassool and Rawaf (2008) demonstrated that the dual learning styles preference group had a higher mean score (M=67.2) than the reflector group (M=57.3) and this was statistically significant (p=0.002).

Overall, the findings from Rassool and Rawaf (2008) suggest that students learn in different ways and this needs to be matched by approaches to teaching. Each learning style uses different parts of the brain and by involving more of the brain during learning; people remember more of what they learn (Hawk & Shah 2007). The motivation, intelligence and prior knowledge of the student also plays a major role in the students' learning (Felicia & Pitt 2009). Studies have identified that educators should not, however, feel pressured to match learning styles with teaching styles, as results do not necessarily improve. Instead, educators should focus on designing a variety of instructional activities that allow learners to engage in active learning (Huxland & Land 2000; Lovelace 2005; Rinaldi & Gurung 2008).

Learning styles theories present some limitations. Firstly, they may fail to recognise how learning styles vary in different areas of content (Reid 2005). Secondly, learning styles do not always take into account the context of learning (Pashler et al. 2009). Therefore, when considering the teaching and learning of clinical skills for the current study, knowing the learning style preferences of the students was considered an important intervention because of the emphasis placed on the students' learning processes. Another important area in learning is to assess learners intellectual strengths by assessing their multiple intelligences (Gardner 1983), which will be discussed in the next section.

2.11 Awareness of multiple intelligences and knowledge acquisition

Multiple intelligences (MI) theory was developed by Howard Gardner (1983), a developmental psychologist. Gardner (1983) suggested that people learn in many ways and are further shaped by their culture, the society within which they live, the people they are surrounded by and that everyone is capable of learning and knowing. Gardner (1983) defined intelligence as "*bio-psychological potential that is drawn on within a culture for a variety of purposes*" (p.557). This suggests that intelligence is located in what people do and their ability to solve problems (Baum et al. 2005). In 1991, Gardner (1991, p. 30) redefined intelligence as:

> *The ability to solve real-life problems, to generate new problems and to create something meaningful or offer a service that is valued within a person's culture or community*.

The definition of intelligence by Gardner (1991) broadens the understanding of intelligence to the effective use of thinking skills. Gardner (2006) further suggested that intelligence is more than a single intelligence quotient ("IQ") or what is referred to as general intelligence or *"g"*. Gardner (1983) argued that general intelligence only referred to logical mathematical and verbal linguistic ability. Gardner (1983) distinguished eight intelligences that he thought every person possessed in varying abilities and suggests that many more intelligences have yet to be identified. Table 2.4 provides a description of the eight intelligences identified by Gardner (1983).

Table 2.4: Multiple intelligences (Gardner 1983)

Intelligence	Description of intelligence
Linguistic intelligence	Ability to use words effectively whether orally or in written format. This also relates to the sensitivity to spoken and written language, the ability to learn languages, and the capacity to use language to accomplish certain goals.
Logical-mathematical intelligence	Ability to use numbers effectively, to problem solve and use analytical skills. It further includes the ability to analyse problems logically. To think of cause and effect connections.
Musical intelligence	Ability to appreciate music, song, tone, pitch. This also relates to the capacity to hear and recognise patterns. Active listening with a connection between music and emotions.
Spatial intelligence	Ability to perceive the visual world. It includes the capacity to visualize and to graphically represent visual ideas. The use of visual aids and colour to aid learning. The ability to work with objects effectively.
Interpersonal intelligence	Awareness of others and the ability to respond effectively to those cues in a pragmatic way. This also relates to peer and co-operative learning. It involves interacting effectively with one or more people in familiar or working circumstances.
Intrapersonal intelligence	To think about and understand one's self. Awareness of self-knowledge and the ability to act on the basis of that knowledge. It also involves being aware of one's own desires, fears, and capacities-and to use such information effectively in regulating one's own life.
Bodily-Kinesthetic intelligence	Ability to control body movement, includes co-ordination, dexterity and speed for goal directed activity. This involves having a sense of timing.
Naturalistic intelligence	Recognition of an individual's environment. The ability to understand patterns and sequences in everyday life. (Gardner added this intelligence in 2000)

In developing his theory, Gardner (1983); combined empirical findings from hundreds of studies he had carried out as well as including cognitive and developmental psychology, neuroscience, anthropology and cultural studies. Each of the eight

intelligences is identified as distinct and separate and as a way in which people accept and retain knowledge and information while at the same time showing themselves and others how they understand the knowledge presented to them (Gardner 1999). It is also recognised that people are stronger in some intelligences than others (Gardner 1999; Sulaiman et al. 2011).

Sternberg (1996) agreed with Gardner (1983) that intelligence is much broader than a single general ability. Sternberg (1996) put forward his own theory, a triarchic theory of intelligence, which incorporated analytical, creative and practical intelligence (Sternberg 1996). The analytical component refers to problem solving abilities, the creative aspects recognises peoples' abilities to deal with new situations based on past experiences and practical intelligence relates to the persons' ability to adapt to a changing environment. Sternberg (1996) further argued that if intelligence is only seen as a unitary trait that is measured by IQ-type tests, then creative and practical thinking will almost certainly be excluded.

A strength identified with the use of MI theory is its ability to provide a framework for educators regarding how they might plan and develop their lesson plans for learning, teaching and working with students who have a variety of abilities (Özdemir at al. 2006). Furthermore, understanding each student's multiple intelligences profile is helpful for planning educational activities that will engage the students (Shearer 2004; Baum et al. 2005). Using MI theory in the classroom setting encourages the student and educator to explore the lesson plan in a variety of ways, thereby, encouraging active learning (Shearer 2004; Weber 2005; Gouws 2007).

There are critics of Gardner's (1983) theory of multiple intelligences (Chen 2004; Willingham 2004; Peariso 2008). Willingham (2004) suggested that Gardner has incorrectly stated that psychometricians see intelligence as a unitary trait. Willingham (2005) further stated that Gardner's (1983) theory of MI is an adoption of the multifaceted view of intelligence where there is no "*g*" intelligence but rather independent intelligences that relate to performance. While many believe that MI theory is one way of understanding the human intelligences, others believe that it is not

always possible to measure these intelligences because they are not tangible (Chen 2004).

From an education perspective, it has been recognised that Gardner (1983) did not provide a plan of how MI theory should be rolled out in the classroom setting and this has led to teachers developing individual programmes that work very separately from his theory (Peariso 2008). This has led to difficulties translating the theory into effective teaching practice. It may also lead to an increased workload for the educator through extra planning and development of lesson plans (Klein 1997). The MI approach to learning and teaching requires a sustained effort over a period of time (Chen 2004).

It is further claimed that there is minimal evidence of the validity of MI theory (Sternberg 1996; Waterhouse 2004). However, Chen (2004) argued that MI theory has been validated by evaluating the results when MI theory is applied in an educational setting. It could, however, be argued that the improved results are due to the introduction of a new method of learning prompted by enthusiastic teachers and student motivation about a new approach to learning and teaching (Shearer 2004; Waterhouse 2004).

Some research suggests that MI enhances learning. For example, Özdemir et al. (2006) compared a MI teaching approach to a conventional teaching approach to explore students' understanding of science concepts with secondary school participants (n=70). Students in the control group (n=35) were taught science using didactic teaching methods while students in the experimental group (n=35) were taught science using multiple intelligences instruction that included a variety of learning activities. All students completed the Teele Inventory of MI prior to commencing the study. Immediately following the teaching intervention the students completed a science test and then completed the same science test two months later. The results from the study found that students taught using the multiple intelligences approach for science instruction achieved better acquisition and retention of knowledge scores. This is a positive finding and shows that retention of knowledge can be increased using Gardner's (1983) MI theory.

Another study conducted by Akkuzu and Akcay (2011) with secondary school students (*n*75) compared the teaching of chemistry using a traditional teacher-centred approach and a multiple intelligences (MI) approach over an eight week period. The researchers wanted to explore if there was a difference in pre-test, post-test and retention-test scores. They also explored the students' attitude to the teaching approaches. A Multiple Intelligences Assessment Survey was completed by the students in the experimental group and the teaching activities were based on the findings. All students completed a chemistry attitude scale and this was used to compare findings between the control and the experimental group. Nine students in the experimental group took part in semi-structured interviews.

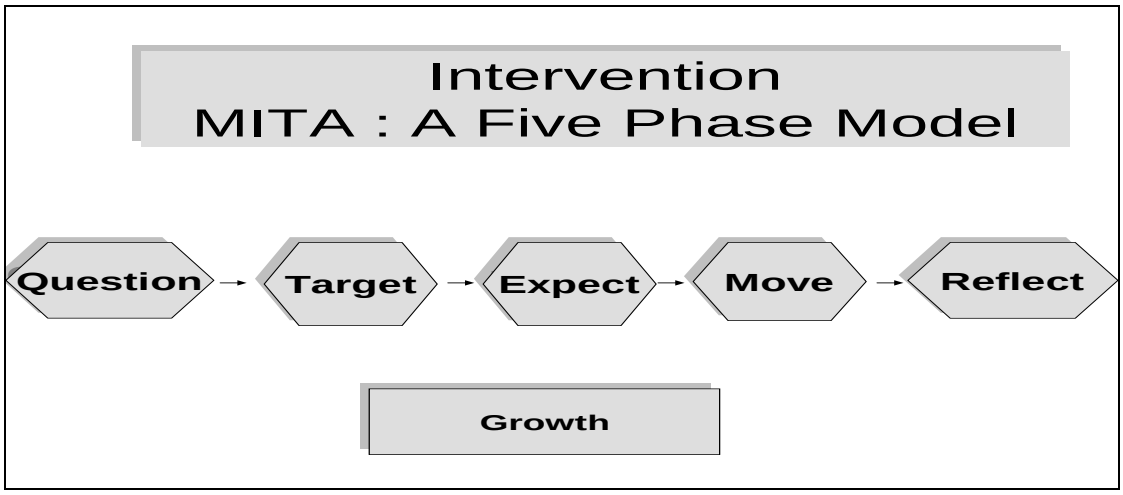
Akkuzu and Akcay (2011) found that students taught using the MI teaching approach had higher scores in the post-test and the retention-test. The results from the attitude scale found that there were significant differences of attitude post-test for the experimental group and that students were positively motivated when taught using a MI approach. The interview data revealed that students' interest in chemistry had increased using a MI approach to teaching and their achievement was also increased. These results show that using a variety of teaching approaches can help with student motivation, can increase interest in the topic while encouraging active engagement in the education process.

The integration of MI theory and learning styles theory may help the educator understand the learning disposition of the students and as a result the teaching approach can be enhanced to encourage student engagement for learning and teaching (Baeten et al. 2010). Tajularipin et al. (2010) suggested that every individual has their own unique intelligence profile and, therefore, adapting teaching to meet these needs should help all learners, regardless of intellectual disposition. The use of the multiple intelligences theory informed the work of Weber (2005) when she developed the multiple intelligences teaching approach that will be discussed in the next section.

2.12 Operationalising multiple intelligences theory using a multiple intelligences teaching approach (MITA)

Traditional modes of instruction mainly meet the needs of students with verbal-linguistic and logical-mathematical intelligences and the main focus of teaching is on knowledge acquisition, memorization and repetition. Weber (1999) developed a five phase multiple intelligences teaching approach (MITA), based on Gardner's (1983) Multiple Intelligences theory, to enhance student understanding and learning (See Figure 2.2). Weber (1999) suggested that MITA is an appropriate teaching and learning model because it is a collaborative attempt to work with educators and learners to bring about learning while recognising the many needs of learners. MITA asks the question "*How am I smart*?" as opposed to "*how smart am I*?" (Weber 2005, p.9).

Figure 2.2: MITA Model



MITA relies on MI theory as well as constructivist teaching and learning approaches. Constructivism theory asserts that learning is developmental and constant and that assimilation, accommodation and construction are the basic operating processes in learning (Olson & Hergenhahn 2009). Constructivist theorists hold the premise that learners build knowledge in an attempt to make sense of their experiences and that those

learners are active in seeking meaning to what they are doing (Vandeveer & Norton, 2005).

The emphasis of the MITA approach is on designing an active, constructive and goal directed learning environment appropriate for the students' cognitive abilities (Weber 2005). Students should have the opportunity to construct knowledge for themselves if personal development is to take place (Barr & Tagg 1995; Amerson 2006). The focus of the MITA five phase approach is on active student learning and participation and consequently differs from the teacher-centred approach (Weber 2005; Denny et al. 2008). Each student brings their own unique abilities and characteristics to the classroom and this must be taken into consideration when planning teaching activities (Beghetto 2007). The teacher provides subject knowledge while creating an atmosphere and a context for learning to take place (Tan & Grigorenko 2010). In addition, Weber (2005) suggested that collaboration, content (integrated curriculum tasks) and criteria (suggestions for assessment) promote brain-based learning.

It must be acknowledged, however, that the teacher also has an impact on the attitudes and values in the classroom that can either lead to creativity and learning or not (Weber 2005; Denny 2007). During each learning activity, each participant, including the teacher, is both teacher and student and learners become a valued part of an interactive exchange amongst people of various ages, cultures and walks of life. Students activate their own unique capability to learn when they are helped to create an increased self-awareness and personal reflection of learning (Brunton & Jordan 2006; Armstrong 2009). This is what Weber (2005) discussed regarding the role of the educator as a facilitator of learning.

The importance of using the five-phase approach is stressed by Weber (2005) and it is, therefore, essential that all phases of MITA are used during each learning experience. Table 2.5 identifies that when links are broken or neglected then growth in learning will not take place.

Table 2.5: MITA Stages

Phases	**1**	**2**	**3**	**4**	**5**	
Ideal	**Question**	**+ Target**	**+ Expect**	**+ Move**	**+Reflect**	**= Growth**
	Question	_____	+ Expect	+ Move	+Reflect	= Confusion
	Question	+ Target	_____	+ Move	+Reflect	= Sloppiness
	Question	+ Target	+ Expect	_____	+Reflect	= Waste
	Question	+ Target	+ Expect	+ Move	_____	=Stagnation

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The use of MITA in clinical skills teaching has potential as it challenges the didactic teaching approaches used by many nurse educators. Nursing could be accused of being rigid in its' approach to education by remaining attached to conventional methods of teaching and learning that fail to engage with the individual learning needs of students (Fullan 2007; Dalley et al. 2008). The educational approaches adopted by nurse educators should be reviewed in terms of the outcomes they achieve in the real world, rather than in the narrow confines of curricular activity (McKenna & Green 2004). MITA encourages nurse educators to recognise that each student is an individual with a variety of intelligences that need to be drawn on and developed further (Weber 2005; Amerson 2006; Strean 2011). Effectively, this should help the student engage in active learning that will motivate them to adopt a deep learning approach because of genuine interest in the subject matter and reinforce learning into the individual's professional development and clinical practice (Weber 1999; Brunton & Jordan 2006; Denny et al. 2008).

Denny (2007) explored the use of MITA with a group of second year nursing students (n=44), in Ireland, for teaching a module called Nursing Practice Studies (NPS) over

two academic years. A quasi-experimental pre-test post-test non-equivalent groups design was used. The intervention for the treatment group (n=26) involved the use of a multiple intelligence teaching approach while the control group (n=18) received traditional teaching approaches. The multiple intelligences development assessment questionnaire (MIDAS IS) was used over the three phases of the study to profile the participants MI profiles and to ascertain if MITA affected treatment group scores on MIDAS MI and IS.

Denny (2007) found statistically significant differences between the treatment and control groups, with the treatment group outperforming the control group in 'Nursing Practice Studies' examination results. The MIDAS MI and IS scores for both the treatment and control groups revealed significant differences in participants' scores and this was also evident one year post the intervention. The MITA intervention was evaluated positively.

It has been established that, when curriculum content is taught to students in a way that encourages them to draw on their creative and analytical abilities, learning is improved (Denny et al. 2008; Denny 2010). Students who have been taught in a creative way have been shown to outperform those students taught in the conventional manner (Grigorenko et al. 2002; Denny 2007; Baid & Lambert 2010). Nurses should bring their critical thinking skills and attitude of enquiry into the real world of practice to improve nursing care being delivered (Ferguson & Day 2007). MITA has the potential to reinforce learning into the individual's professional and clinical practice by the use of many brain-based activities used in teaching (Weber 2005). Further studies are needed to investigate the advantages and disadvantages of MITA as an educational strategy for clinical skills learning and teaching.

2.13 Adapting assessments to meet student learning needs

If multiple intelligences theory and learning style theory are an integral part of the education process, which was argued in the preceding section, then the process of student assessment requires evaluation and modification in contemporary education, if students are to benefit from student centred learning. Much of the work students

undertake and their approach to learning is often driven by the method of assessment (Freeman & Lewis 2002; EAQA 2005). It should be clearly noted that assessment is not an end in itself, but a vehicle to enable continuous improvement and development in the learning process (Suskie 2006; Trotter 2006).

When developing an assessment it is important that is valid, reliable, authentic and understandable (Welsh & Swan 2002; Weber 2005; Race 2005; Quinn & Hughes 2007; HETAC 2009). The assessment process requires careful consideration when students are set to enter professional practice, such as nursing, as they are required to possess specific knowledge, skills and attitudes, which constitute competency (Hargreaves 1997; Jones et al. 2010).

Assessment is determined by the programme and the module outcomes (Murphy & Moon 1994). Kouzlin and Garb (2004) suggested that there is an inherent contradiction between the goals of student assessment (evaluation of learning ability) and its means (measuring students' current performance level). It is argued that students adopt strategic approaches to learning in relation to assessment and often learn what they think they will be marked on (Biggs 2003; Struyven et al. 2005; Bryan & Clegg 2006). Huntley-Moore (2006) suggested that to assist students learn they should be provided with critical questions that enable deep understanding of curricular content. Feedback following assessment (either formative or summative) is considered an essential part of the assessment process and has been equated to confidence building, a way of evaluating self-learning and is considered a valuable form of support for learning for understanding (Gardner1983; Struyven et al. 2005). Gibbs (2010) argued that part of the problem in higher education has been the provision of meaningful feedback to large numbers of students.

Assessment methods are often dictated by the resources available, the subject under examination and by historical precedence (Furnham et al. 2008). It has been shown that there is a relationship between the learning style preferences of students, multiple intelligences preferences and the method of preferred assessment (Weber 2005; Furnham et al. 2008). The use of multiple choice examinations (MCQ) and group work is favoured by students who are recognised as surface learners (Nighuis et al. 2008; van

de Waterling et al. 2008; Bengtsson & Ohlsson 2010). Surface learning is described as the way in which students attempt to memorise all the details of a lesson and then replicate all the facts for the purpose of an assessment (Biggs et al. 2001). Students learn that if they are to achieve higher marks in examinations then rote learning can be beneficial in many circumstances, depending on the workload for the semester (Sand-Jecklin 2006; Furnham et al. 2008). However, it has been identified in the literature that recall of key information post examinations and assessments that utilise surface approaches to learning, is three to five years (Suk et al. 2003; Furnham et al. 2008)

In contrast, students who adopt a deep approach to learning favour timed examinations, oral examinations and continuous assessments as methods of assessment, as they require a deeper understanding of curricular material (Chamorro-Premuric et al. 2007; Furnham et al. 2008). Deep learning or deep processing focuses on integration, synthesis and reflection (Laird et al. 2008). Active learning, in combination with critical thinking skills, helps foster a deep approach to learning. The learner makes a connection or links with previous known concepts and principles and then they can build on this for future problem solving (Knowles 1990). Reflection, regarded as a form of metacognitive ability, is considered essential for the purpose of developing deep learning (Saito & Miwa 2007).

Continuous assessment has a number of advantages, namely; it takes place over a period of time, it can meet the diverse learning range of student abilities and it supports deep approaches to learning (Armstrong 2009). The disadvantages include unremitting motivation and the availability of valid and reliable tests (Race 2005). Practical assessments, or OSCEs, are used in nursing to assess competency in clinical skills (Bartfay et al. 2004; Byrne & Smyth 2007). OSCEs as a mode of assessment pose some concern and this is mainly in relation to stress experienced by students that in turn can affect performance (Bartfay et al. 2004; Brosnan et al. 2006; Rushfort 2006).

When planning for assessment it should be viewed as an integral part of the delivery of a programme and the main emphasis should hinge on how to extrapolate the learning achieved by students. This is to ensure that the process of identifying learning is not merely assessment driven, but is part of the process where students can develop a range

of knowledge, skills and attitudes (De Young 2003). Therefore, when planning assessments it is essential to find an appropriate method, while using it in conjunction with the subject matter, if students are to engage appropriately with the learning material (Freeman & Lewis 2002; Struyven et al. 2005; Amin et al. 2011). Rust et al. (2003) argued that increasing attention should be given to the student's involvement in the assessment process. Consequently, assessment tools should be developed that enable students to outline their choices in relation to the assessment modalities used in modules of study.

2.14 Implications of the literature review for the current study

This review has explored the literature in relation to clinical skills and methods of teaching and learning clinical skills. A vital component of the pre-registration nursing programme is clinical skills education. It has been established that the processes involved in both teaching and learning clinical skills is complex and multi-faceted and that there is a need for a student-centred approach to ensure effective acquisition. It is apparent that there is a gap in the evidence base relating to teaching and learning of clinical skills. Using brain based approaches, such as MITA, may be an innovative teaching approach that can be implemented for teaching clinical skills while maintaining the quality of clinical skills education. As MITA is a structured teaching and learning approach that facilitates all students, it has the potential to promote a practical teaching strategy of engagement with the individual learner. Therefore, based on the gap in the evidence base, this study seeks to explore if MITA is an effective method of teaching clinical skills to first year undergraduate nursing students?

Chapter 3 - Methods

Introduction

This chapter focuses on the methodology and methods used in this study. The research aims and objectives will be presented followed by the hypotheses, outcome measures, and design, procedure and ethical considerations. Data analysis techniques used in the study are also described.

3.1 Study design

For the purpose of this study, an experimental design using a randomised controlled trial (RCT) was chosen to test the hypotheses. The rationale for using a RCT was considered because it is the most robust method for testing the effectiveness of the teaching approach, MITA, for teaching clinical skills. No previous study had used this methodology to evaluate the effectiveness of the MITA approach for teaching clinical skills. A true experimental design has three main design properties, randomisation, control and manipulation (Shadish et al. 2002; LoBiondo-Wood & Haber 2010). Randomisation is particularly important for RCTs as it generates equivalence over a range of variables and is considered more objective in enhancing the internal and external validity of the study (Cohen et al. 2007).

When using a RCT design it is important that all the participants have an equal probability of being assigned to any group, thereby creating groups that are similar to each other, thereby, controlling for specific characteristics (Shadish et al. 2002). Another important feature of RCTs is the process of control that involves all the participants being treated in the same manner except for the intervention that they receive (Cohen et al. 2007). Manipulation is the third property of RCTs and refers to the process of "*doing something*" and making a change in one variable and then observing the effect of that change on a different variable (Shadish et al. 2002).

3.2 Aim of the study

The study aimed to test the effectiveness of using a multiple intelligences teaching approach (MITA) in teaching clinical skills to first year undergraduate nursing students.

3.2.1 The objectives of the study

The research objectives were to:

1. Assess if teaching clinical skills using MITA affected end of semester OSCE results between experimental and control groups
2. Identify if there was a relationship between learning styles preferences and MIDAS IS preferences
3. Determine if there was a relationship between learning styles and MIDAS IS profiling and OSCE results between experimental and control groups
4. Determine if there was a relationship between participants preferred method of MI assessment using the MI preferences assessment questionnaire and OSCE results
5. Explore first year nursing students' experiences of the MITA approach to clinical skills teaching

3.2.2 Research Question

Is MITA an effective method of teaching clinical skills to first year undergraduate nursing students?

3.3 Research and null hypotheses

This study tested the following null and research hypotheses:

MITA Intervention

1. H_0: Teaching clinical skills using MITA has no effect on participants' OSCE results.
2. H_1: Teaching clinical skills using MITA will have an effect on participants' OSCE results.

Learning Style Preferences

1. H_0: Teaching clinical skills for learning styles preferences has no effect on participants' OSCE results.
2. H_1: Teaching clinical skills for learning styles preferences will have an effect on participants' OSCE results.

MI Preferences

1. H_0: Teaching clinical skills for MI preferences using MITA has no effect on participants' OSCE results.
2. H_1: Teaching clinical skills for MI preferences using MITA will have an effect on participants' OSCE results.

MI Assessment Preferences

1. H_0: Teaching clinical skills for MI assessment preferences has no effect on participants' OSCE results.
2. H_1: Teaching clinical skills for MI assessment preferences will have an effect on participants' OSCE results.

3.3.1 Independent and Dependent Variables

The independent variable that was manipulated in this study was the method of teaching (MITA).

The dependent (outcome) variable was the OSCE scores achieved by participants.

3.4 Recruitment and sampling

This exploratory RCT took place in a single site in Ireland using the total population of nursing students (*n*=93) available in year one, 2011. All nursing students registered in year one of the general, psychiatric and intellectual disability nursing programmes (BSc Honours) were invited to participate in the study on a voluntary basis at the start of the academic semester. An academic colleague spoke to all the participants in a core class (all three disciples were in class together) and explained the study. A written explanation was provided at this time and participants were asked to read the information and if they had any further questions they could seek clarification from the researcher.

All students who enrolled (*n*=93) agreed to participate, three withdrew from the programme before any data were collected leaving a total of 90 students. Table 3.1 shows the disciplines of nursing at the study site and the numbers recruited for the study.

Table 3.1: Student disciplines and numbers

Nursing Discipline	**Total at registration**	**Total after 2 weeks**
General	45	44
Psychiatry	30	29
Intellectual Disability	18	17
Total	**93**	**90**

3.4.1 Sample

In this study an available sample was chosen using a random stratified sampling frame, in this case, all first year nursing students undertaking the nursing programme in three disciplines of the 2011intake (Greaney & Kellaghan 1996; Howitt & Cramer 2000). The maximum number of participants that could be recruited to the study was 93, therefore, it was decided that all students would be targeted for inclusion. The total number of participants after two weeks was 90 (*n*=90) with the allocation of 46 to an experimental group (*n*=46) and 44 to the control group (*n*=44). This sample size was

considered sufficient to detect with probability 80%, a statistically significant difference between MITA and the conventional teaching approach and reflected the constraints of an unfunded study and the potential complexity of a multi-site study. A sample power calculation estimated the need for a sample of 795 which would was required for a multi-site study. This may have introduced confounders associated with the different educational sites. For logistical reasons this was not possible for this study.

Following recruitment to the study the participants were assigned an individual code. Participants were then randomly assigned to the control and the experimental group by an independent member of academic staff using a computer generated number sequence (Each student was identified by a number and discipline, for example, G1, P5, ID7). Stratified random sampling was the method used for allocation to the control and experimental groups to ensure that an equally proportionate number of students were randomly assigned from each of the three disciplines of nursing (Strata-General, Psychiatric and Intellectual Disability) enrolled at the study site. This was considered appropriate as the representativeness of the sample in relation to the population is maximised (Cohen et al. 2007). Blinding was not possible in this study as the researcher was the person who taught all the clinical skills to the participants in the experimental group. Participants in the control group were taught by a team of lecturers (n=6) with participants knowing they were in the control group.

3.5 Ethical considerations

The research proposal was submitted to Waterford Institute of Technology Ethics Committee where approval to conduct the study was granted. Confirmation of this is included in appendix 8. An interview was part of the ethics process. At the interview the Ethics Committee asked that participants give permission for their OSCE scores and examination results be made available to the researcher and a tick box stating this was added to the consent form. The Ethics Committee further advised that the researcher should not be involved when participants were completing their OSCEs to prevent any bias (contamination) from occurring.

All participants were invited to participate on a voluntary basis to the study, by an academic colleague at a core class (combination of the three disciplines) in September 2011. The right not to participate and the right to withdraw from the study at any time were fully explained. Participants were informed that this would not have any implications for their progression in their nursing programme (Cohen et al. 2007; Polit & Hungler 2010). All participants were provided with detailed information, in verbal and written format, in relation to the role of the participant and the role of the researcher for the study. The researcher, as a lecturer on the programme, was aware that the participants were in a very vulnerable position and, therefore, it was essential to negate any feelings of coercion (Cohen et al. 2007; LoBinodo-Wood & Haber 2010). Informed consent took due cognisance of the four key elements; competence, voluntarism, full information and comprehension when recruiting all participants (Diener & Crandall 1978). It is also important to remember that "*informed consent implies informed refusal*" (Cohen et al 2007; Polit & Hungler 2010), consequently, all participants were fully aware that they could withdraw at any point during the progress of the study. All participants (n=90) who took part in the study signed a consent form (Appendix 9).

3.5.1 Anonymity

The participants' identities were known only to the researcher. The identities of participants and all documents resulting from the research were concealed and no reference was made to any individual names during the study or in the findings section.

3.5.2 Confidentiality

Confidentiality was assured to all participants in the information sheet and consent forms. Participants were informed they would be assigned a unique identifier number for the duration of the study. The list with matching names and unique identifier was locked in a filing cabinet in the researcher's office, which was only accessible by the researcher. Information collected from instrumentation (ILS results and the MITA evaluation questionnaire) was stored in a locked filing cabinet in the researcher's office.

Information stored on the computer was password protected and was only available to the researcher, in line with the Data Protection Act (2003).

3.6 Pilot study

A pilot study is a preliminary trial of the research instruments that is designed to test and check the validity and reliability, that is the psychometric properties of the instrument used (Patton 2002; Polit & Hungler 2010). A pilot study was undertaken from September 2010 to May 2011 using the four instruments (ILS, MIDAS IS, MI Assessment Preferences, & OSCE Criterion Based Checklist). For the purpose of the pilot study first year students (2010 cohort- BSc (Hons) programme, General, Psychiatry and Intellectual Disability) were asked to participate. Written information was provided to the group on leaving the lecture hall by an academic member of staff. The pilot study was carried out as it has the potential to provide additional knowledge that leads to an improved main study (Lancaster et al. 2004). Thus the researcher carried out the pilot study to answer the following questions:

- Did the participants understand what was asked of them by taking part in this study?
- Did the data collection methods (Index of Learning Style (ILS) questionnaire, MIDAS IS profile or the MI assessment preferences questionnaire) collect the information sought?
- Did the participants encounter any problems when completing the questionnaires?
- Were the lesson plans for teaching clinical skills using MITA clear to the participants?
- Did the MITA evaluation questionnaire collect the information sought?
- Was it possible to analyse the data generated by these methods?
- What recommendations or revisions were required to improve the planned study?

To achieve the objectives of the pilot study it was important that it was conducted under similar conditions to those anticipated for the main study (Lancaster et al. 2004; LoBinodo Wood & Haber 2010). This was to ensure that any possible weaknesses, inadequacies or any problems could be identified during the pilot phase so as to ensure that similar problems were not encountered during the main study (Sarantakos 2005; LoBinodo Wood & Haber 2010).

3.6.1 Refinements undertaken as a result of the pilot study

To ensure rigour and to minimise bias a number of issues were identified from the pilot study that needed to be modified before the main study took place. There were, however, some issues regarding the management of data collection, namely, familiarisation with the theory behind the instruments used to assess ILS and MI (MIDAS). Participants would have five educational sessions on learning styles and MI theory, delivered in a module called '*Learning to Learn'* instead of three educational sessions that took place in the pilot study. In the pilot study another area of concern revolved around the participants' ability to fill out the questionnaires on-line. It was, therefore, decided that training in information technology (IT) would commence earlier in the semester (September 2011, cohort undertaking study), for example, showing participants how to send an attachment so that they could forward their results in a timely manner to the researcher.

Furthermore, in the pilot study all participants were afforded the opportunity to meet with the researcher to explore their questionnaire results (ILS questionnaire, MIDAS IS profile or the MI assessment preferences questionnaire) but they did not avail of this opportunity. Therefore, specifically timetabled meetings with the researcher were scheduled during semester one of the main study. Feedback on ILS, MIDAS IS and MI assessment preferences is an important aspect of student personal development and planning for their future learning needs and consequently this aspect of the study was given due consideration. Evaluation at the end of the semester by the participants in the treatment group clearly identified that the lesson plans using MITA were very clear and

did not require any changes for the main study. Table 3.2 shows the data collection process for the pilot study.

Table 3.2: Data collection process for pilot study

Semester 1 (September 2010 – December 2010)			
(*n*)	**Data collection order**	**Teaching week**	**Assessment tool**
(*n*=85)	Data collection 1	3 and 4 (September /October)	Index of learning styles questionnaire
(*n*=98)	Data collection 2	3 and 4(September /October)	MIDAS profile
(*n*=98)	Data collection 3	13 (December)	OSCE practical examination (Baseline)
Semester 2 (January 2011 - May 2011)			
Teaching intervention (MITA) 12 weeks			
(*n*)	**Data collection order**	**Teaching week**	**Assessment tool**
(*n*=10)	Data collection 1b	10 (April)	MI assessment preferences questionnaire
(*n*=40)	Data collection 2b	12 (May)	Evaluation of MITA teaching
(*n*=98)	Data collection 3b	13 (May)	OSCE practical examination (Time 1)

3.7 Data collection instruments

The data collection tools used to answer the research questions in this study were:

1. Objective Structured Clinical Examination (OSCE)
2. Index of Learning Style questionnaire (ILS)
3. MIDAS MI and IS profile
4. MI assessment preferences questionnaire, developed by the researcher

Each participant was allocated a personal code in both the control and experimental groups and this was to prevent any participant being identified. This personal code remained the same for the duration of the data collection process. All participants were asked to complete the ILS, MIDAS MI and IS profile and the MI assessment questionnaire during different weeks in semester 1 (September to December) 2011, to gather baseline information. Questionnaires were distributed over a number of weeks to encourage completion of all the questionnaires. Participants were invited to bring the results with them to the researcher where their learning style preferences, MI strengths and MI assessment preferences were discussed on an individual basis. Participants also completed the MI assessment preferences questionnaire at the end of semester 2, May 2012. The scores from the participants' OSCE were collected at two time points, at the end of semester one (December 2011) and at the end of semester two (May 2012). Table 3.3 identifies the timetable for data collection for the study.

Table 3.3: Timetable for data collection process

Semester 1 (September 2011 – December 2011)			
Total completed	**Data collection order**	**Teaching week**	**Assessment tool**
(*n*=90)	Data collection 1	3 & 4 (September / October 2011)	Index of learning styles questionnaire
(*n*=89)	Data collection 2	5 & 6 (October 2011)	MIDAS IS profile
(*n*=61)	Data collection 3	7 & 8 (October / November 2011)	MI assessment preferences questionnaire
(*n*=90)	Data collection 4	13 (December 2011)	OSCE practical examination (Baseline)
Semester 2 (January 2012 – May 2012)			
Teaching intervention – MITA (12 weeks)			
(*n*) (Total that completed)	**Data collection order**	**Teaching week**	**Assessment tool**
(*n*=86)	Data collection 1b	10 (April 2012)	MI assessment preferences questionnaire
(*n*=44)	Data collection 2b	12 (May 2012)	Evaluation of MITA teaching – experimental group
(*n*=90)	Data collection 3b	13 (May 2012)	OSCE practical examination (Time 1)

3.8 Objective structured clinical examination (OSCE) design

Contemporary perspectives of OSCEs have gained widespread acceptance as a valid academic measurement of nursing competence, because of the increased emphasis placed on knowledge, skills, values and attitudes, which constitute competency (Wessel et al. 2003; Rushforth 2007; Walsh et al. 2009). Using Miller's (1990) pyramid the OSCE measures the "shows how" or "performance" of skills and competencies in relation to skills attainment and assessment (Alinier 2003; Rushforth 2007).

The instrumentation for the OSCEs in this study was developed by the module team at the study site. This was to provide consistency and continuity of the theory delivered, the recommended reading provided and skills practice for the participants. A criterion-based checklist was developed for the skills to be examined that included, hand washing, temperature, pulse, respiration and blood pressure at Baseline. At Time 1, skills examined included, hand washing, subcutaneous injection and nebuliser therapy, as agreed by the module team (See sample Appendix 10). The criterion-based checklist provided step by step instructions for performing each psychomotor skill and objective evaluation of each skill (Jeffries 2007). Criterion-based checklists are easy to follow and have been used effectively in the past for OSCEs, using Likert scales or scales that used performed well or did not perform well scoring (Sedlack et al. 2004; Hutton et al. 2008). Written descriptors of the three scoring levels used in this study included: performed consistently, performed but not fully competent and not performed / or incompetent. These descriptors were developed by the module team and were provided to all assessors in advance of the examination day, to ensure consistency and continuity of assessment.

The OSCE checklists for all skills examined were made available to the participants two weeks prior to the OSCE day and this was an attempt to reduce stress levels, particularly as the group were first year nursing students (Rushforth 2007). When participants are made aware of the marking criteria, in advance of an OSCE, learning is enhanced (Byrne & Smyth 2007). Additionally, these checklists help with assessor reliability when testing the skills on the day of the OSCE (Byrne & Smyth 2007). However, it is important to recognise that it is impossible to control for individual reactions to this method of examination, for example, stressful environment, as identified by Owens and Walden (2001).

Two weeks prior to the examination, all participants (n=90) were provided with a practice session and the lecturer provided feedback on their performance. Ramsden (2003) considers practice sessions as a necessary prerequisite for deep learning to occur. Nulty et al. (2011) also support this contention and suggest that feedback to participants

with regard performance is pivotal to the achievement of competency in nursing undergraduate skills learning.

3.8.1 OSCE procedure

The assessors, on entry to skills laboratory stations, informed each participant that they would have to complete three skills stations for their examination and read a prepared written statement. This statement was developed by the module team to ensure consistency and continuity of approach. Each OSCE was marked as a pass or a fail and participants who had more than two / three ticks (depending on number of steps on the checklist for each skill) in the not performed / incompetent column were marked as a fail (as agreed by the module team). The OSCEs were videotaped using in built cameras in the skills laboratories and this was to facilitate external moderation. Participants were familiar with these cameras as they are used for training purposes during their clinical skills sessions. At the end of the three stations the participants were provided with an opportunity to reflect on their performance and to identify omissions, in a written format, that may have taken place. If a participant failed an OSCE, the assessor together with the OSCE coordinator informed the participant, discussed the performance and highlighted deficits in performance. Participants were then informed that they were required to attend a further supervised skills session, within the next five days, so that feedback could be given prior to re-taking of the examination, the following week.

At Baseline (December 2011) each participant completed three compulsory work stations with an allocated time of twenty minutes and participants were required to demonstrate three practical skills, namely, hand washing, TPR and BP. For the skill of TPR participants were asked "*What would you expect the temperature to be if it was in the normal range*?" This was because a temperature could not be recorded on a mannequin. Participants were asked to record a normal temperature on the observation chart.

At Time 1 (May 2012) each participant was required to demonstrate three practical unrelated skills, namely, hand washing, sub cutaneous injection and nebuliser therapy

within a time frame of twenty-five minutes. This examination followed the same procedure, as at Baseline.

It has been suggested that preparation for the OSCE examination should include a process of close observation, checks and feedback (Bartfay et al. 2003; Bloomfield et al. 2010). Feedback has been identified as essential for helping participants to focus attention on the important aspects required for learning specific skills, but this needs to be given in a timely and meaningful fashion, as previously discussed (Childs & Sepples 2006; Nicol 2006; Gibbs 2010; Nulty et al. 2010). A discussion or a debriefing at the end of the OSCE session helps to focus the participant on their learning and clinical competence (Alinier 2003; Nulty et al. 2011). Time constraints and large numbers of participants rotating through the OSCE stations can lead to poor or no feedback being given (Selim et al. 2011). Consequently, in the current study, extra time was built into the OSCE process so as to provide valuable feedback to each participant (Eldarir et al. 2010).

3.8.2 Validity of the OSCE

The validity of an OSCE can be increased by having a wide range of skills and competencies tested, by using a large number of trained examiners, increasing assessor objectivity by using a pre-determined checklist and by participants undertaking the same skills and questions (Khattab & Rawlings 2001; Rushforth 2007; Selim et al. 2011). Lack of validity using a simulated approach during OSCEs has been recognised as problematic (Watson et al. 2002; Park et al. 2004).

Content validity of the OSCE checklists, in this study, was established by having four members of the module team review the criterion-based checklists. This was considered appropriate as the expert people to evaluate the checklists had in-depth knowledge of the skills to be assessed (Polit & Hungler 2010). Identifying the learning outcomes and competencies to be achieved early in the process was another way of helping to increase the validity of the OSCE process and this took place at the start of semester 1 2011 by the module team (Newble 2004; Nulty et al. 2011).

3.8.3 Reliability of the OSCE

Reliability in relation to assessment relates to the probability that if the assessment is repeated under stated conditions for a period of time that an item, for example, the OSCE, will deliver similar results (Mitchell et al. 2009). It is argued that the reliability of the OSCE is improved through the use of standardisation and objectivity (Bartfay et al. 2003). Having predetermined OSCEs criterion-based checklists is one way of improving the objectivity of an instrument, even though this is not always the case (Barman 2005; Byrne & Smyth 2007). Reliability of the OSCE is strengthened by two other factors, namely, good assessment schedule design and appropriate training for examiners (Nicol & Freeth 1998; Rushforth 2006). All staff involved in the OSCEs were provided with the skills sheets and marking criteria three weeks prior to the OSCE date. A meeting was held two weeks preceding the OSCEs and any issues of concern were discussed. In this study a simulated environment with the use of mannequins, which models a clinical site, was used, and this is an additional way of improving the reliability of the OSCE (Brosnan et al. 2006). Nursing students from year 4 (n=3) at the study site were asked to complete the skills using the criterion-based checklists to identify any problems or misunderstandings and they reported no problems. Two nursing lecturers at the study site also completed the checklists with these students (n=3), simultaneously, and no problems were identified.

3.9 Index of learning style (ILS)

In weeks three and four of semester 1 (last week of September and first week of October) 2011, participants were asked to complete the ILS online. Participants were informed that the online questionnaire would take less than twenty minutes to complete. The ILS is a free 44-item self-scoring instrument and respondents are asked to choose one of two endings to a sentence that focuses on an aspect of learning (www.ncsu.edu/effective teaching) (Appendix 11). The ILS model recognises that individuals have preferences along four bipolar continua and consists of four dimensions of learning: active-reflective; sensing-intuitive, verbal-visual and sequential-global

(Felder & Silverman 1988). Participants received the results of their learning style preferences by email.

A uniform resource locator (URL) on the ILS online site provided a feedback page and suggested learning strategies for each area of learning preference to participants and they were encouraged to read this data. Permission to use the ILS online was sought and granted from one of the original authors, Dr. Richard Felder. Having explored the literature for available tools to measure learning style preferences it was decided to use the ILS because of its validity and reliability in the literature (Livesay et al. 2002; Felder & Spurlin 2005). In addition, the language is easy to understand and it can be completed within a short time frame and it is a tool that alerts the educator to the variety of learning styles within the classroom. A further advantage of using the ILS model is that it has a sliding scale that supports the classification of the participants' styles in a more flexible way than using bipolar models (Alfonseca et al.2006).

3.9.1 Validity of ILS

The Web based version of the ILS is taken over 100,000 times a year and it has been used in a number of studies (Livesay et al. 2002; Felder & Spurlin 2005). Content validity of the ILS instrument is supported in the literature (Felder & Brent 2005; Litzinger & Felder 2005). Factor analysis studies have shown that most of the ILS scales are well defined, however, the sequential-global and sensing-intuitive preferences show a degree of overlap (van Zwanenberg et al. 2003; Zywno 2003; Platsidou & Metallidou 2009). Preferences for sensing and active learning measured on the ILS correlate with preferences for sensing and extraversion measured with the Myers-Briggs Type Indicator and this shows further indication of convergent validity (Rosati & Felder 2003; Zywno 2003). Convergent content validity of the ILS has been demonstrated in studies that have taken place over time, across similar groups and in similar settings (Zywmno 2003; Platsidou & Metallidou 2009). When studies were carried out in populations with different characteristics, statistically significant differences were found at p=0.05 level in the mean scores of active – reflective and sequential – global scales and at p=0.01 at the visual –verbal scale (van Zwanenberg et al. 2003).

3.9.2 Reliability of ILS

The test re-test reliability of this instrument is considered satisfactory with $p < 0.05$ after 4 weeks (Seery et al. 2003). A further study demonstrated $p<0.05$ after 7 months (Livesay et al. 2002). Internal consistency reliability was, however, considered low and only just acceptable (van Zwanenberg et al. 2000; Felder & Spurlin, 2005). It is suggested that the ILS is best used to identify the relative strengths of an individuals' learning style preferences and it is thought this was the original intention of the instrument (van Zwanenberg et al. 2000).

3.10 Multiple intelligence development assessment scale and intellectual styles

In weeks five and six of semester 1 (October 2011), all participants were invited to complete the MIDAS IS questionnaire (Appendix 11). Each participant was provided with an online link to complete the MIDAS IS. Participants were encouraged to complete the questionnaire in their own time, preferably in a quiet area away from distractions and were told the questionnaire took up to thirty minutes to complete. An individual response, with a three page report, was sent back to each participant through the email address they provided. The justification for the use of MIDAS IS is twofold; firstly, the MIDAS IS is significantly different from MI tests available in books and on-line (Gardner 2004); secondly, there is no recognised data based on MI assessment. MIDAS IS was designed to meet the principles of sound assessment as advocated by Gardner (1991 [Shearer 2004]). Gardner (2004) stressed that the use of *quick-and-dirty* MI tests that promote superficial labeling and a distorted understanding of MI theory should not be encouraged. The MIDAS IS is not an objective test of intelligence because the data are compiled from the perceptions of a knowledgeable observer or person completing the test (Shearer, 1994), but it is an objective assessment of multiple intelligences or intellectual dispositions.

3.10.1. Validity and reliability of MIDAS IS

The MIDAS IS was developed over a period of six years using a combination of rational and empirical methods of test construction using MI theory as a basis to guide interpretation of empirical results (Shearer 1996). Studies of MIDAS IS have been validated in a series of studies involving tens of thousands of respondents around the world (Shearer 1996b; Buros 1999; O' Connor & Brunton 2003; Denny 2007). The validity and reliability of the MIDAS MI instrument as a measure of perceived intellectual disposition has been described in the MIDAS MI Professional Manual and have been also favourably evaluated suggesting support for its use within educational contexts (Shearer 1994; McNamee et al. 2002; Hsueh 2003; Denny 2007).

The validity of the MIDAS has been examined in a series of investigations evaluating its concurrent, predictive and construct validity, which have included expected correlations between MIDAS MI and IS scale scores and several matched abilities tests (Shearer 1994; O'Connor & Brunton 2003; Denny 2007). The results of a concurrent and predictive validity study concluded that "*accumulated evidence supports its validity as a tool to gather useful and meaningful data regarding an individual's profile in seven areas of everyday intellectual functioning*" (Shearer & Jones, 1994, p.28). This study found that a majority of the scales correlated appropriately with tests of performance in the expected skills and abilities. The scale relating to naturalist intelligence was only developed by Gardner in 1999 and, therefore, the Cronbach's co-efficient levels refer to that time. This signifies that respondents answered the questions for each set of questions, around a particular theme, consistently.

The mean internal consistencies of each MIDAS scale fell in the high-moderate to high range, with alpha coefficients ranging from 0.78 to 0.89 (median=0.86). Wiswell, et al. (2001) found that reliability coefficients ranged from 0.85 to 0.90. From an international perspective similar alpha coefficients were obtained for all scales when translated (Yoong 2001 (Malaysia); Pizarro 2003 (Spain)). The test-retest reliability has also taken place showing one month stability coefficients ranging from 0.76 to 0.92 (M=0.84) and two-month stability coefficients ranging from 0.69 to 0.86 (M=0.81)

across the various intelligence scales (Shearer 1996a). Table 3.4 illustrates reliability results with MIDAS IS for the current study.

Table 3.4: Test re-test results of the reliability of MIDAS MI and IS (Shearer 1994)

Multiple Intelligence Scales	**Cronbach's Alpha Coefficient**
Music	**0.86**
Kinaesthetic	**0.84**
Logical Math	**0.90**
Spatial	**0.86**
Linguistic	**0.91**
Interpersonal	**0.82**
Intrapersonal	**0.75**
Naturalist	**0.91**
Intellectual Styles	**Cronbach's Alpha Coefficient**
Leadership	**0.85**
General Logic	**0.77**
Innovation	**0.84**

3.11 Background and development of multiple intelligences assessment preferences questionnaire

This questionnaire was developed by the researcher specifically for this study to identify student preferences for assessment and was based on the eight multiple intelligences identified by Gardner (1983) (Appendix 11). The questionnaire was developed in "Survey Monkey®", an online system that allows for the development of Web-based

surveys. Participants were invited to complete the questionnaire online, in their own time, in weeks seven and eight (October and November) in semester 1 2011. Participants were told it would take no longer than fifteen minutes to complete. A statement of purpose, including confidentiality and anonymity, was prepared to encourage to the students to complete the questionnaire.

3.11.1 Design and administration of MI assessment preferences questionnaire

Questions one and two in the MI assessment preferences survey were rank ordered as participants were asked to compare different items directly to one another (LoBionodo-Wood & Haber 2010). This was to encourage the participants to differentiate between items that they may have regarded as equivalent. Questions three and four were answered using a six point Likert scale and participants were requested to indicate their level of agreement by ticking their preferred option for each statement. The format of the Likert scale included; strongly agree = 3, moderately agree = 2, agree = 1, moderately disagree = - 2, strongly disagree = -3 and a no opinion element = 0. For question 3 this produced a scale of –24 to + 24 and for question 4 this produced a scale of -21 to +21. Scores with a minus indicated disagreement with each statement and positive scores were seen to show an agreement with each statement. Further information collected included current programme of study, sex and age (Appendix 11).

Two weeks after the participants were invited to complete the questionnaire, all participants had a further verbal reminder from the module leader and a further two questionnaires were completed. There was a participant response rate of 84% at Baseline. Participants also completed the questionnaire at the end of semester 2 (May 2012) with a response rate of 92%. Data was downloaded from "Survey Monkey®" and analysed used a predictive analytical statistical software (PAWS), version 17.

3. 11.2 Validity and reliability of MI assessment questionnaire

All the statements in the questionnaire were assessed for face and content validity. An expert panel that included two academic supervisors and a statistician were involved throughout the development of the MI assessment preferences questionnaire. Two

academic members of staff with experience of MI were also consulted. The questionnaire was pilot tested to check for meaning, relevance, interpretation, errors and instructions by nursing lecturers (n=3) at the study site and nursing students (n=7) from fourth year at the study site, prior to inviting first year nursing students (n=90) to complete. Those involved in the pilot study were also asked to monitor the time it took to complete the questionnaire in an attempt to increase the participation rate. Minor modifications were made to the questionnaire, such as, making sure that all questions had to be answered. Some minor typing errors were also identified.

Internal consistency was calculated using Cronbach's alpha coefficient to check that the items in the scale measured the underlying construct, that is, MI assessment preference. All items were above the recommended level of 0.7 for Cronbach's alpha and, therefore, remained within the scale in the final calculation of the alpha value (Bland & Altman 1997).

3.12 Teaching of clinical skills for all participants (procedure)

A total of 12 clinical skills were taught in semester 2 (January to May 2012), as part of the Medication Management 1 module. Prior to each practical class all participants attended a mandatory one hour lecture, which was based on the theoretical component of each skill that was to be taught. This was important as the participant was required to have a level of knowledge prior to the practical skills session. All participants then attended a mandatory one hour clinical skills session each week in the skills laboratory in their dedicated groups of five or six participants. A summary of the teaching interventions are displayed in Table 3.5. Whilst 12 skills were taught to all participants, only three skills were examined; namely, hand washing, subcutaneous injection and nebuliser therapy, using an OSCE selected by the module team.

Table 3.5: Teaching intervention

Conventional teaching method	Teaching intervention using MITA
Participants attended 1 hour mandatory theory class	Participants attended 1 hour mandatory theory class
Participants attended 1 hour mandatory skills laboratory session in groups of 5 or 6	Participants attended 1 hour mandatory skills laboratory session in groups of 5 or 6
Video demonstration Lecturer demonstration Repeated practice Feedback from lecturer Skills sheet developed for each skill	Video demonstration Lecturer demonstration Repeated practice Feedback from lecturer Skills sheet developed for each skill MITA teaching plan Reflection – personal and group Picture board available on the college virtual learning environment

3.12.1The conventional teaching method (procedure)

Participants in the control group were taught using traditional teaching and learning approaches. This included use of video demonstration using DVDs of all skills being taught from a Clinical Skills Website, developed by City University London and operated by Elsevier Ltd. A demonstration of one skill took place each week and participants then had the opportunity to practice the skill and receive feedback on their performance from the lecturer. Skills sheets that were specific to the skill being taught were made available to the participants and lecturers prior to class, through the College's open source course management system (CMS). The content of the skills sheets was based on up to date literature and policies from local clinical sites and were developed by the module team (see sample Appendix 12). The traditional teaching and learning method was delivered by a team of six lecturers. They were familiar with the recommended theory and practice of the skills being taught in this module and had experience of teaching these skills for the preceding six years.

3.12.2 Multiple intelligences teaching approach (MITA)

The experimental group were taught clinical skills using a MITA and this was carried out by the researcher only. This included the use of video demonstration, as already identified, the use of repeated demonstration and feedback and the use of skills sheets developed by the module team. However, a teaching plan, specific to MITA, was devised for the experimental group to ensure that learning objectives were met for each of the clinical skills sessions using MI. A rubric, which is an explicit description of performance characteristics, was created for each teaching plan and was specific to the particular skill being taught. The lesson plan identified the expectations for each session and was based on contemporary research (Appendix 12 see example).

The MITA model consists of a five–phase strategy that facilitates participants' learning by engaging their strengths, both individually and in collaboration with others (Weber 2005).

Each skills teaching session followed the following 5 phase MITA model.

- Phase 1 (question) started with what Weber (2005) describes as a two-footed question. This was a question that helped gain the participants' attention and to focus the participant on the learning that was to take place. For example, the session for subcutaneous injection started with "what is your understanding of subcutaneous injection and why is it important for you to learn this skill for clinical practice?"(Vygotskian theory (1978) / constructivist approaches to learning).
- Phase 2 (target) set the targets for each clinical skills session where specific outcomes for each session were negotiated. Setting targets encourages participants to consider possible solutions. For example, asking the participant what they already knew in relation to the skill being taught and what they needed to learn in the skills session. The participants were informed at the start of each session that they would be questioned on this information at the end of the class time in an attempt to keep them focused throughout the skills teaching session, which in addition affords closure to a session.

- Phase 3 (expect) recognised that participants need direction to meet specific learning needs and they need to know what to expect for each skills session. Each participant was provided with specific feedback in order to develop their reflective skills before progressing to the next phase, phase 4.
- Phase 4 (move) provided assessment tasks that matched related learning approaches using MI to motivate participants to explore related knowledge of the theory and clinical practice being taught. The participants worked in pairs (intrapersonal intelligence) to discuss what they had learned in relation to the specific skill. MITA helps students resolve any practice issues they may have encountered either through the demonstration of the skill or through the theory using MI.
- Phase 5 (reflect) included reflection time and participants were given time, both personally (interpersonal MI) and as a group (intrapersonal), to consider what they had learned in each session. Participants in this study used a whiteboard to showcase their learning (pictorial representation or specific words) to demonstrate one thing they had learned specifically that day. This then lead to a group discussion where key learning points were re outlined. Driscoll's (2000) Model of Reflection was used to augment this part of the session. Using this model participants were challenged on the *what, so what and now what* did they learn and how they could develop their understanding further. Each participant was also encouraged to keep a reflective journal of personal learning throughout the twelve week semester and this further encouraged the participants to develop their understanding of the skills being taught.

As part of the MITA intervention, participants in the experimental group also had access to extra material on the college's CMS, in the form of picture boards that had been created by the researcher for each skill. A separate discussion forum was also established in the college CMS if participants wished to make use of it. Peer review on each MITA session plan was sought from Dr. Ellen Weber in Rochester, New York, who provided the MITA training for the researcher. MITA session plans were then edited based on her feedback.

3.13 Data analysis

As stated previously, four instruments were used for data collection in this study namely; OSCEs, ILS, MIDAS IS and MI assessment preferences questionnaire. A database was created in PASW to manage and analyse the data. OSCE scores were entered manually into the database. Similarly, data from the ILS and the MIDAS IS were manually coded and entered into this database. Finally, data from the MI assessment preferences questionnaire was downloaded directly from Survey Monkey® into a separate PASW file and then merged with existing data. A random sample of the data (10%) was thoroughly checked to ensure that mistakes were not made (LoBinodo-Wood & Haber 2010; Polit & Hungler 2010). Additionally, following recommendations by Polit and Hungler (2010), the data were cleansed through a process that involved careful examination of the inputted information for values that appeared to lie outside the normal range.

Descriptive statistics were used to describe the demographics and characteristics of those involved in the study. Descriptive statistics were also used to summarise the findings from the four tools used. Inferential statistics were used to test the stated hypotheses. A variety of tests were used to analyse the data. Normality assumptions were verified by means of Normal Probability Plots and more formal tests-Kolmogorow-Smirnof. Diagnostic analyses were performed and indicated that there were no concerns regarding underlying statistical assumption of normality.

A summary of data analysis are shown in Table 3.6. For all statistical tests in this study, the significance level was set at $p<0.05$. This value is increasingly considered the maximum acceptable rate for Type I error (Bordens & Abbott 2007). In addition, the setting of statistical significance at 5% was justified because there was no study, apriori, which specifically addressed OSCE assessment using MITA.

Table 3.6: Summary of data analysis

Objective	Outcome measure	Type of data	Test used
To explore the effect of MITA compared with the conventional teaching approach	OSCE scores	Continuous Categorical	Independent t-test Mann-Whitney U test
To compare the scores of hand washing OSCE scores between the control and the experimental group	OSCE scores	Continuous Categorical	Independent t-test
To explore the differences of ILS scores based on gender / discipline / control and experimental group	Participant questionnaire	Continuous Categorical	Independent t-test 1 way ANOVA
To explore the influence of ILS on OSCE scores	Participant questionnaire OSCE scores	Continuous Categorical	Kruskal-Wallis test
To explore the differences of MIDAS IS scores based on gender / discipline / control and experimental group	Participant questionnaire	Continuous Categorical	Independent t-test Chi-square test 1 way ANOVA
To explore the influence of MI on OSCE scores	Participant questionnaire OSCE scores	Continuous Categorical	Kruskal-Wallis test
To explore the differences of MI assessment preferences questionnaire based on gender / discipline / control and experimental group	Participant questionnaire	Continuous Categorical	Independent t-test Chi-square test 1 way ANOVA
To explore the influence of MI assessment preference on OSCE scores	Participant questionnaire OSCE scores	Continuous Categorical	Kruskal-Wallis test

3.14 Evaluation of MITA

Participants in the experimental group were asked to evaluate the MITA skills classes (Appendix 13). Part I of the questionnaire used a five point Likert-type response scale, with the range of response levels from strongly disagree (SD) =1 to strongly agree (SA)=5. The key areas addressed within this questionnaire included:

- Use of MITA by lecturer to teach clinical skills
- Lecturer preparedness
- MITA approaches to learning clinical skills
- Student evaluation

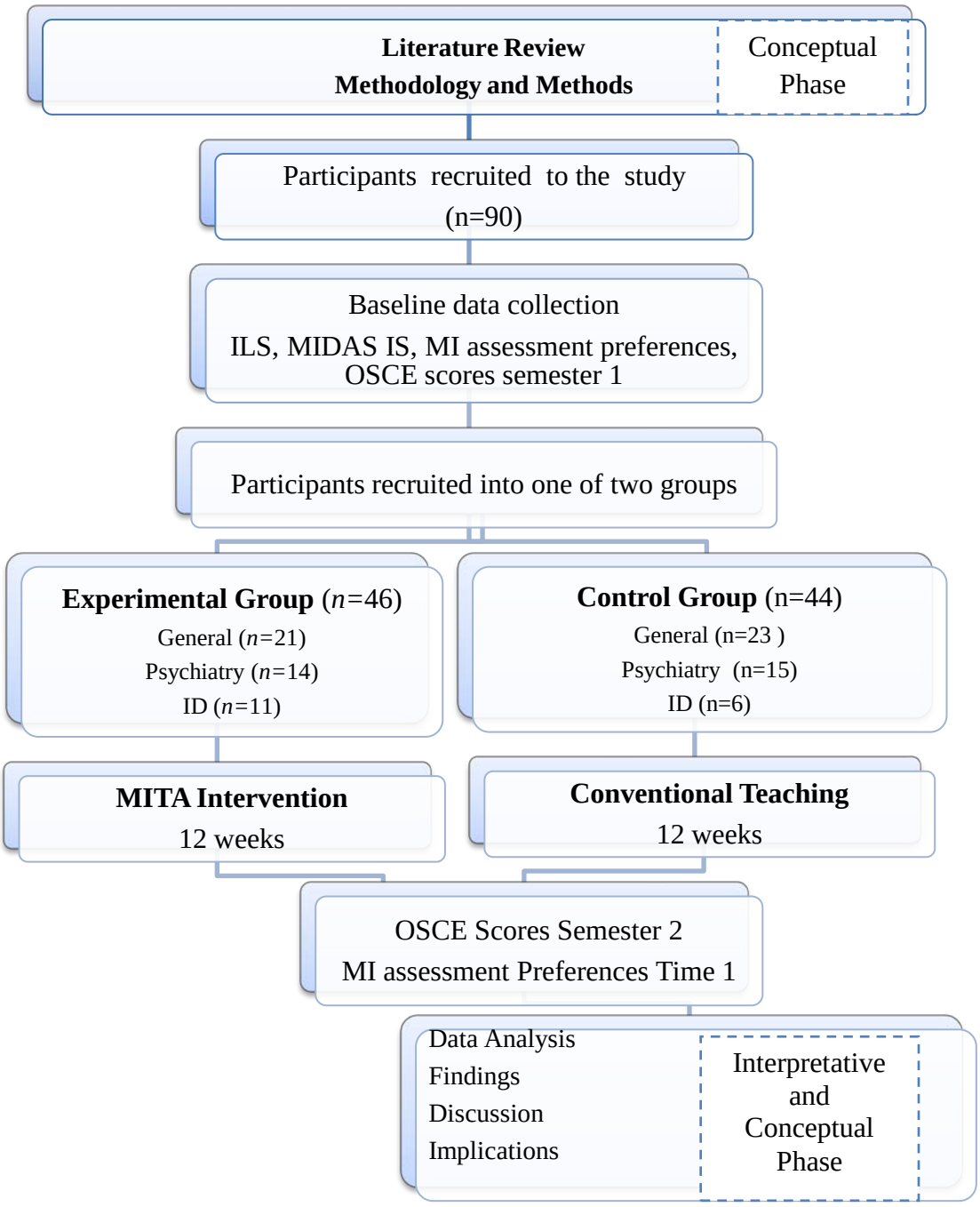
Descriptive statistics were used to describe the results from the first part of the evaluation of MITA. Part II of the questionnaire consisted of four open-ended questions that were designed to collect qualitative accounts of what participants found positive and negative about the MITA skills teaching sessions, recommendations for future skills teaching sessions using MITA and any further comments that they may have had regarding the use of MITA for skills teaching. The written responses were read, coded and categorised into themes by the researcher. The occurrence of identical words were recorded, counted, coded and categorised (for example, interesting, reflecting and learning).

Catergorising can be described as "*…themes… that enable the analyst to reduce and combine data"* (Corbin & Strauss 2008, p. 159). The counting of words was used to simplify the trends occurring and to retain the subjectivity from the summaries that were generated. Content validity was assessed by taking all of the qualitative data and asking a qualitative researcher to confirm the findings. Through a process of negotiated consensus between the primary coder and the checker of data, final agreement was reached and a consolidated checklist was generated (Krippendorff 2004). No major ambiguities were found between the primary coder and the checker of the data.

Conclusion

In this Chapter the methodological approach adopted and the methods used to carry out this study were critically discussed. The rationale for using a RCT was presented and the instruments used in the study were discussed in relation to their psychometric properties. The OSCE as a method of assessing clinical skills was considered an appropriate tool for measuring clinical skill acquisition for this study, which was based on the empirical literature. The application of suitable statistical techniques was discussed. In conclusion, the Chapter is summarised in Figure 3.

Figure 3.1: The study design



The findings of the study are presented in the next chapter.

Chapter 4 - Findings

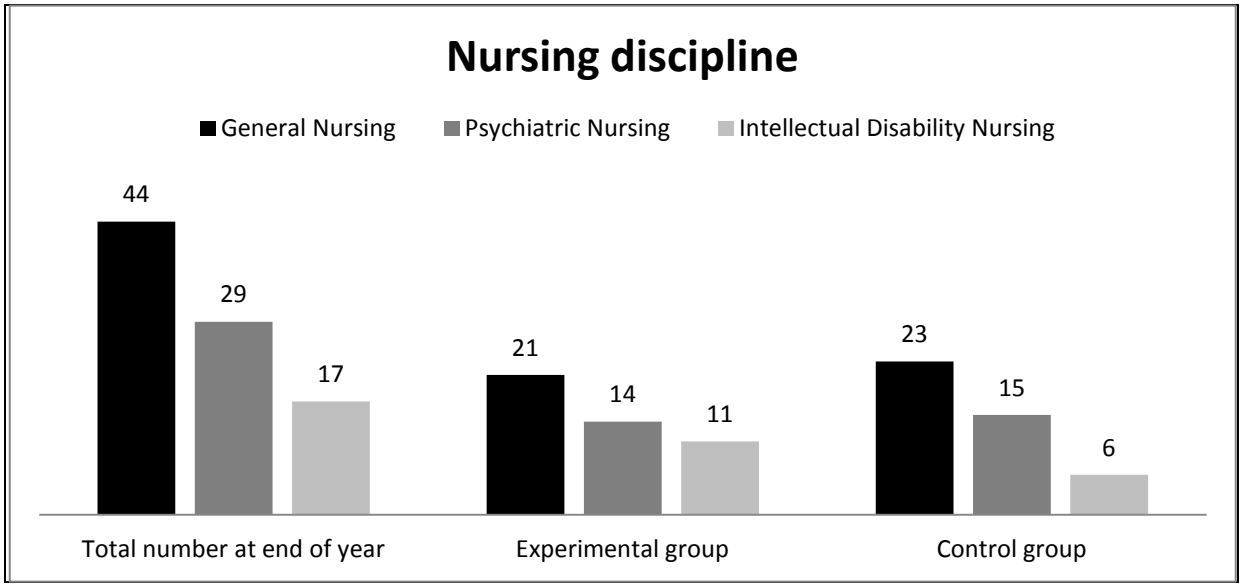
Introduction

This chapter presents the results of the research. The purpose of this study was to test the effectiveness of MITA for clinical skills teaching and learning in a third level educational setting. The results are presented in a tabular format and thereafter described. First demographic details of participants are outlined and then OSCE scores will be presented. These analyses are followed by the findings of ILS, MIDAS IS and MI assessment preference scores, which are presented using a similar layout. The chapter concludes with experimental group participants' evaluation of MITA.

4.1 Demographics

A total of 93 first year nursing students were enrolled in the nursing programme at the beginning of the academic year. After two weeks, three students had left from the programme (n=90). Figure 4.1 illustrates the participants by nursing discipline.

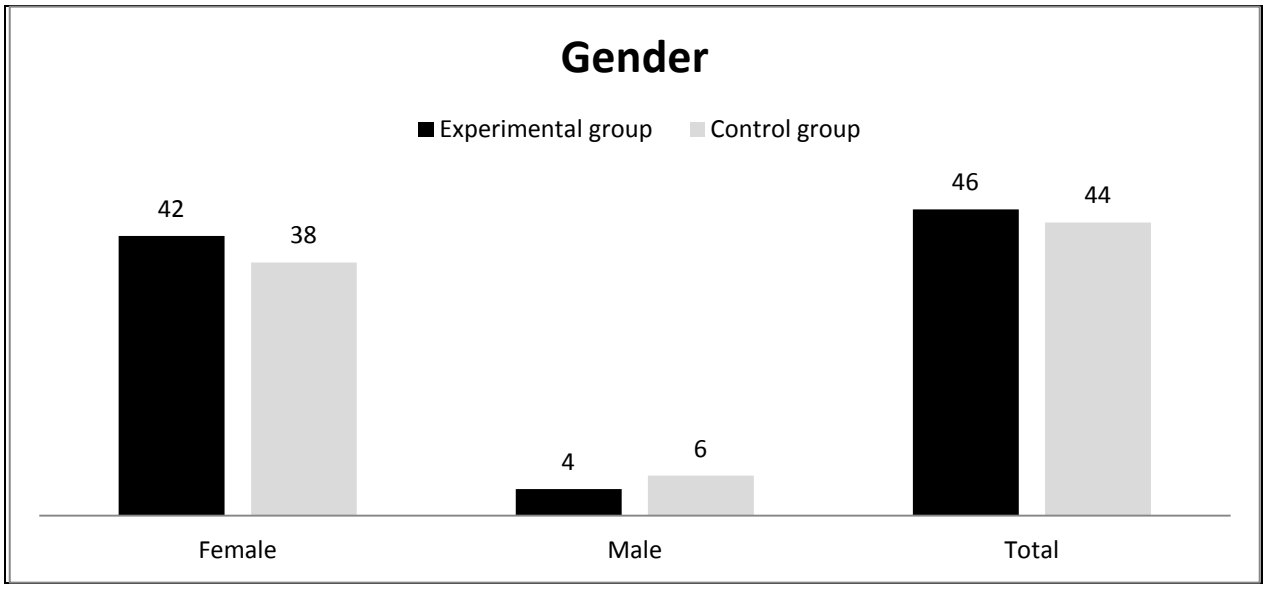
Figure 4.1: Student numbers and disciplines



4.1.1 Gender

Figure 4.2 shows that there was a greater percentage of females (88.9%, *n*=80) than males (11.1%, *n*=10) in the study. Fisher's (1971) exact test indicated that the genders did not differ significantly between the experimental and control groups (*p*=0.518, two-tailed).

Figure 4.2: Gender



4.1.2 Age

The age of the participants ranged from 18 to 51 years (mean 21.73; SD 5.331). The age distribution of the experimental and control groups is illustrated in Table 4.1.

Table 4.1: Age and group

Age	**Median**	**Min**	**Max**	**Mean**
Experimental (*n*=46)	20.00	18.00	34.00	21.55
Control (*n*=44)	20.00	18.00	51.00	21.93

The Mann-Whitney U test (two-tailed) was conducted to determine if significant differences existed between the experimental and control groups at Baseline regarding age. This showed no significant difference in the ages of the experimental group (*Md*=20, *n*=46) and the control group (*Md*=20, *n*=44), *U*=985.50, *z*=-0.22, *p*=0.825, *r*=0.02.

4.2 Objective structured clinical examination (OSCE) scores

OSCE examination scores are presented in the following order: Baseline, between group analysis and comparisons of change at Time 1. The research questions posed at the beginning of the study were:

1. Are there differences between the experimental and control groups at the end of semester 1 OSCE scores?
2. Are there differences between the experimental and control groups at the end of semester 2 OSCE scores?
3. Has teaching for MI using MITA influenced the participants' OSCE scores?
4. Is there a statistically significant difference between experimental and control groups and OSCE scores?

4.2.1 OSCE findings for all participants

In this section the OSCE findings at Baseline and Time 1 for all participants are presented.

4.2.2 Baseline scores

All participants completed an OSCE examination at the end of semester 1 (Baseline) with three skills examined, namely: hand washing, TPR and BP. The OSCE scores are shown in Table 4.2 and show the mean and standard deviation scores (maximum score 100) for the control and experimental groups. No statistical significance was found at the 5% level of significance between the control and experimental groups.

Table 4.2: OSCE scores for all participants at the end of semester 1

Clinical skill	Group	n	Mean (SD)	Range of scores	P value
Hand washing	Experimental Control	46 44	92.17 (7.60) 90.15 (7.53)	73 – 100 73 – 100	0.20
Temperature, pulse, respiration	Experimental Control	46 44	90.53 (11.76) 87.82 (11.89)	57 – 100 43 - 100	0.28
Blood pressure	Experimental Control	46 44	87.68 (16.08) 83.79 (12.70)	27 – 100 33 - 100	0.20

4.2.3 Time 1 findings

All participants completed an OSCE at the end of semester 2 (Time 1) where three skills were examined namely; hand washing, subcutaneous injection and nebuliser therapy. Table 4.3 presents these results. Statistical significance was found at the 5% level of significance for all three OSCE scores; (p=0.01).

Table 4.3: OSCE scores for all participants at the end of semester 2

Clinical skill	Group	n	Mean (SD)	Range of scores	P value
Hand washing	Experimental Control	46 44	98.41 (4.70) 94.85 (8.84)	80 – 100 53 - 100	0.01
Subcutaneous injection	Experimental Control	46 44	95.45 (6.83) 90.55 (10.74)	74 – 100 58 - 100	0.01
Nebuliser therapy	Experimental Control	46 44	95.54 (6.34) 90.45 (9.87)	75 – 100 55 - 100	0.01

4.2.4 Comparison of hand washing OSCE scores at Baseline and Time 1

All participants (experimental group n=46 and control group n=44) completed the skill of hand washing at Baseline and Time 1. Table 4.4 shows the mean and standard deviation of hand washing scores (Maximum score 100). There was an increase in scores for both groups from Baseline to Time 1. At Time 1 the experimental group mean score was 3.56 points above the control group and this was a statistically significant difference (p=0.01). One participant (1.1%) failed the hand washing OSCE at Baseline (from experimental group) and one participant (1.1%) failed the hand washing OSCE at Time 1 (from control group).

Table 4.4: OSCE hand washing scores at Baseline and Time 1 for experimental and control groups

Study phase	Group	n	Mean (SD)	Range of scores (%)	P value
Baseline	Experimental Control	46 44	92.17 (7.60) 90.15 (7.53)	73 - 100 73 - 100	0.20
Time 1	Experimental Control	46 44	98.41 (4.70) 94.85 (8.84)	80 - 100 53 - 100	0.01

4.2.5 Comparison of hand washing OSCE scores between groups

The equivalent non-parametric test, Mann-Whitney U test, was conducted to compare the medians of the experimental and control groups for comparison of hand washing

OSCE scores. The results from the Mann-Whitney U tests confirmed those of the independent *t* -tests. The Mann-Whitney U test revealed no significant difference in the hand washing scores at Baseline for the experimental and control groups. However, the Mann-Whitney U test revealed significant differences in the hand washing scores for Time 1 experimental and control groups with a medium effect size 0.40. The results are presented in Table 4.5.

Table 4.5: Comparison of hand washing test scores between groups at two time points

Study phase	Group	n	Mean Rank	Median	Mann-Whitney U test	P value	r
Baseline	Experimental Control	46 44	42.05 48.80	86.67 93.33	*U*= 860	0.19	0.19
Time 1	Experimental Control	46 44	39.61 51.13	98.01 100.00	*U*= 753	0.01	0.40

4.2.6 Comparison of Baseline and Time 1 hand washing scores for experimental and control groups

The Wilcoxan signed ranks test was also used to compare the hand washing scores at Baseline and Time 1 for the experimental and control groups. The difference between the two sets of scores was statistically significant with the Time 1 scores higher than the scores achieved at Baseline, z=4.941, p<0.001 with a large effect size (r=0.52).

4.3 Findings of the questionnaires used in the study

The following section describes the findings of the three questionnaires used in this study, namely ILS questionnaire, MIDAS IS and MI Assessment Preferences questionnaire. Each of the scales was examined to identify if the findings were influenced by the experimental and control group and to ascertain if gender or discipline had an effect on the overall results.

4.3.1Index of Learning Styles (ILS) results

This section presents the ILS preferences. The ILS was used to identify the preferred learning styles of all the participants (Felder and Solomon 1998). All participants (n=90) completed the ILS at Baseline. The research questions posed at the beginning of the research for ILS questionnaire were:

1. What are ILS scores of participants at Baseline?
2. Are there differences in participants ILS scores between experimental and control groups at Baseline?
3. Has gender or discipline influenced ILS scores?
4. Has teaching for learning styles influenced OSCE scores?

4.3.2Learning style preferences and experimental and control groups

Table 4.6 shows the mean scores for learning style preferences for the experimental and control groups. No statistical significant difference was found in any of the eight learning style preferences, (p>0.05).

Table 4.6: Results for learning style preferences for the experimental and control groups

		Learning style		**Learning style**		**Learning style**		**Learning style**	
	n	**Visual** Mean	**Verbal** Mean	**Active** Mean	**Ref** Mean	**Sensing** Mean	**Intuitive** Mean	**Seq** Mean	**Global** Mean
Experimental	46	1.46	0.30	1.24	0.39	1.67	0.70	1.28	0.28
Control	44	1.34	0.43	0.95	0.43	1.68	0.56	1.09	0.34
P value		0.59	0.37	0.16	0.78	0.96	0.55	0.30	0.65
Total	90								

Key: Ref = reflective, Seq = Sequential

4.3.3 Learning style preferences and gender

Table 4.7 presents the learning style preferences total mean scores and mean scores for female and male participants. An independent t-test was conducted to test for statistical significance between females and males for each of the eight learning style preferences and no statistical significant difference was found (p>0.05). The learning style preference with the highest score was sensing (M=1.68; SD 0.95) and the learning style preference with the least score was intuitive (M=0.20; SD 0.64).

Table 4.7: Learning style preferences mean scores by gender

		Learning style		**Learning style**		**Learning style**		**Learning style**	
	n	**Visual** Mean (SD)	**Verbal** Mean (SD)	**Active** Mean (SD)	**Reflective** Mean (SD)	**Sensing** Mean (SD)	**Intuitive** Mean (SD)	**Seq** Mean (SD)	**Global** Mean (SD)
Female	80	1.39 (1.00)	0.36 (0.68)	1.10 (0.96)	0.43 (0.72)	1.70 (0.94)	0.16 (0.56)	0.50 (0.29)	0.29 (0.59)
Male	10	1.50 (1.17)	0.40 (0.69)	1.10 (0.99)	0.30 (0.48)	1.50 (1.08)	0.50 (1.08)	1.00 (1.21)	1.21 (0.85)
Total	90	1.40 (1.01)	0.38 (0.69)	1.10 (0.96)	0.41 (0.70)	1.68 (0.95)	0.20 (0.64)	1.19 (0.87)	0.31 (0.61)

Key: Seq = Sequential

4.3.4 Relationship between learning style preferences and nursing disciplines

A one-way between-groups analysis of variance (ANOVA) with planned comparisons was conducted to explore the impact of the ILS on the three disciplines in the study and results are shown in Table 4.8. Participants were divided into three groups according to their discipline (Group 1: general nursing students; Group 2: psychiatric nursing students; Group 3: intellectual disability nursing students). There was no statistically significant difference between disciplines (p>0.05) in any of the eight learning styles.

Table 4.8: Testing for relationship between ILS and nursing disciplines

Learning style	F	P value
LSI Visual Between groups	0.13	0.87
LSI Verbal Between groups	0.32	0.72
LSI Active Between groups	1.85	0.16
LSI Reflective Between groups	0.49	0.61
LSI Sensing Between groups	1.23	0.29
LSI Intuitive Between groups	0.86	0.42
LSI Sequential Between groups	0.21	0.81
LSI Global Between groups	0.26	0.76

4.3.5 Influence of learning style and OSCE scores

According to the Kruskal-Wallis test there were no significant differences between the learning styles of the participants and OSCE scores at Baseline for hand washing (H=1.68 ;1df; p>0.05); TPR (H= 2.85;1 df; p>0.05) and BP (H=5.95;1 df; p>0.05). Similarly, at Time 1 no significant differences were identified for hand washing (H=7.46; 1df; p>0.05); subcutaneous injection (H=6.86; 1df; p>0.05) and nebuliser therapy (H=10.43 ;1df; p>0.05).

4.4 MIDAS IS questionnaire findings

This section presents MIDAS IS score results. The MIDAS IS questionnaire was completed by participants (experimental and control) at Baseline (n=89) to determine their MI and IS profiles.

The research questions posed at the beginning of the research for the MIDAS IS questionnaire were:

1. What are MIDAS IS profile scores of participants at Baseline?
2. Are there differences in participants MIDAS IS scores between the experimental and control groups at Baseline?
3. Has gender or discipline influenced MIDAS IS scores?
4. Has teaching for MI influenced the participants' OSCE scores at Time 1.

4.4.1 Multiple Intelligences scores for all participants

The MIDAS MI questionnaire was completed to ascertain individual MI profile scores and highest-ranking intelligence. Table 4.9 sets out the MIDAS MI profiles scores. This shows that the strongest multiple intelligence was interpersonal (M=62.58; SD 13.454) and naturalistic intelligence (M=39.58; SD 20.185) was indicated as the weakest intelligence.

Table 4.9: Multiple Intelligences scores for experimental and control groups

Multiple intelligence	***n***	**Mean**	**SD**
Interpersonal	89	62.58	13.45
Intrapersonal	89	48.86	13.86
Linguistic	89	48.74	18.69
Kinesthetic	89	41.74	18.33
Spatial	89	41.71	18.37
Musical	89	41.19	18.12
Logical – mathematical	89	40.37	18.00
Naturalistic	89	39.58	20.18

4.4.2 MIDAS MI and between groups analysis

The MIDAS MI was examined to test for statistical significant difference between the experimental and control group using an independent two-sample t-test (two-tailed). No statistical significant difference was found between the groups (p>0.05). (See Table

4.10). This shows that participants in the experimental group and the control group identified interpersonal MI as their highest intelligence followed by intrapersonal MI.

Table 4.10: Means and T-Test results for MI for experimental and control groups

Multiple Intelligence	Group	*N*	Mean	SD	P Value
Interpersonal	Experimental Control	45 44	64.79 60.13	13.24 13.48	0.10
Intrapersonal	Experimental Control	45 44	48.52 48.52	14.07 13.06	0.99
Linguistic	Experimental Control	45 44	49.63 46.66	18.83 17.16	0.44
Kinaesthetic	Experimental Control	45 44	39.95 42.95	18.51 17.99	0.44
Spatial	Experimental Control	45 44	40.67 41.88	17.61 18.53	0.75
Musical	Experimental Control	45 44	42.12 40.17	18.71 17.83	0.61
Logical-mathematical	Experimental Control	45 44	40.75 38.93	16.54 18.43	0.62
Naturalistic	Experimental Control	45 44	20.53 38.88	3.06 2.93	0.89
Total		**89**			

4.4.3 MIDAS MI scores and gender

A Chi-squared test for independence (with Yates Continuity Correction) indicated no significant difference between gender and experimental and control group for MI scores as is evident in Table 4.11.

Table 4.11 Chi-square test results for MI and gender

MI	*n*	Gender	Phi Coefficient	P Value	df
Interpersonal	809	Female Male	0.85	0.29	59
Intrapersonal	809	Female Male	0.89	0.26	64
Linguistic	809	Female Male	0.86	0.16	56
Kinaesthetic	809	Female Male	0.64	0.61	40
Spatial	809	Female Male	0.77	0.68	59
Musical	809	Female Male	0.88	0.17	54
Logical-mathematical	809	Female Male	0.79	0.51	57
Naturalistic	809	Female Male	0.85	0.26	59

4.4.4 Multiple Intelligences preferences for nursing disciplines

A one-way between-groups analysis of variance (ANOVA) with planned comparisons was conducted to explore the impact of the MIDAS MI on the three disciplines included in the study. Participants were divided into three groups according to their discipline, as before, (Group 1: general nursing students; Group 2: psychiatric nursing students; Group 3: intellectual disability nursing students). There was no statistically significant difference between disciplines ($p>0.05$) in any of the eight MI as is evident in Table 4.12.

Table 4.12: Results for MI preferences and nursing disciplines using ANOVA

Multiple Intelligence	F	P Value
Interpersonal Between groups	2.16	0.31
Intrapersonal Between groups	2.54	0.08
Linguistic Between groups	0.72	0.48
Kinaesthetic Between groups	0.49	0.61
Spatial Between groups	1.03	0.35
Musical Between groups	0.10	0.90
Logical Mathematical Between groups	2.17	0.12
Naturalistic Between groups	0.37	0.69

4.4.5 MIDAS Intellectual Style (IS) results

As part of the MIDAS IS profile, all participants were assessed for their intellectual style findings. The findings from the IS preferences are presented in Table 4.13. This identified the IS of leadership as having the highest score, followed closely by the IS of general logic and the IS of innovative had the lowest score.

Table 4.13: Intellectual style preferences for experimental and control groups

Intellectual style	*n*	Mean	SD
Leadership	89	54.77	14.63
General Logic	89	50.46	14.23
Innovative	89	41.26	16.19

4.4.6 Experimental and control group comparisons for MIDAS IS preference

An independent two-sample *t* test (two-tailed) was conducted on IS scores to investigate if significant differences existed between the experimental and control group at Baseline on leadership, innovative and general logic scores. The results are presented in Table 4.14. No statistical significant difference was found between the experimental and control groups and IS preference ($p>0.05$).

Table 4.14: Results for MIDAS IS: Experimental and control groups

Intellectual style	Group	*n*	Mean	SD	P Value
Leadership	Experimental Control	45 44	55.20 53.60	14.67 14.08	0.59
General Logic	Experimental Control	45 44	50.89 49.48	13.75 14.55	0.63
Innovative	Experimental Control	45 44	39.80 41.85	16.13 15.43	0.54

4.4.7 MIDAS IS and gender

An independent samples *t* test (two-tailed) was conducted on IS scores to investigate if significant differences existed between gender at Baseline on leadership, innovative and general logic scores (See Table 4.15). This showed that there was no statistically significant difference between females and males for MIDAS IS, $p>0.05$.

Table 4.15: Results for MIDAS IS and gender

Intellectual style	Gender	*n*	Mean	SD	P Value
Leadership	Female Male	80 9	54.00 58.12	14.14 16.26	0.41
General Logic	Female Male	80 9	61.34 48.94	17.54 13.20	0.10
Innovative	Female Male	80 9	40.24 45.95	15.48 17.98	0.30

4.4.8 Comparison of MIDAS IS preference and nursing disciplines

A one-way between-groups analysis of variance (ANOVA) with planned comparisons was conducted to explore the impact of the MIDAS IS on the three nursing disciplines. There was no statistically significant difference between the disciplines (p>0.05) in the three IS (See Table 4.16.).

Table 4.16: Results for comparison of MIDAS IS and nursing disciplines

Intellectual style	F	Sig
Leadership	1.29	0.28
General Logic	2.70	0.17
Innovative	0.45	0.63

4.4.9 Influence of MI and OSCE results

According to the Kruskal-Wallis test, analysis of the scores for the OSCE scores in relation to the MI of participants revealed no significant differences between the classifications at Baseline for hand washing (H= 1.13; 1 df; p>0.05); TPR (H= 1.79;1df; p>0.05) and BP (H=3.28; 1 df; p>0.05). At Time 1 no significant differences were revealed for hand washing (H=4.14; 1 df; p>0.05); subcutaneous injection (H=4.24; 1 df; p>0.05) and nebuliser therapy (H=5.12; 1 df; p>0.05).

4.4.10 Relationship between MI strongest preference and learning style strongest preference

The highest percentage for MI preferences was interpersonal (52.80%). The highest learning style preference using the ILS was mixed (a combination of more than one learning style) (40.40%) followed by visual (22.50%). This was then cross tabulated to examine if there was a relationship between MI strongest preference and ILS strongest preference. The results suggest a relationship between interpersonal MI and visual ILS (n=13; 27.70%). A further relationship is suggested between interpersonal MI and sensing ILS (n=9; 19.10%).

4.5 MI Assessment preferences questionnaire

This section presents the MI assessment preferences results. The questionnaire was completed by participants (experimental and control) at Baseline with a response rate of 67.7% (n=61). The questionnaire was also completed at Time 1 with a response rate of 95.5% (n=86).

The research questions posed at the beginning of the research for the MI assessment preferences questionnaire were:

1. What are the MI assessment preferences of participants at Baseline?
2. What are the MI assessment preferences of participants at Time 1?
3. To determine if there is a relationship between participants' preferred method of MI assessment using the MI preferences assessment questionnaire and OSCE results.

4.5.1 Written assessment preferences

The participants were asked to rank their answers in order of preference in relation to written assessments. At Baseline (61%) and at Time 1(65%) of participants ranked

written assessments which encourage practical application of practice experiences, as their first preference in relation to written assessments. Table 4.17 shows the results.

Table 4.17: Written assessments and rank scores

Written assessments	**Encourages use of experiences from practice**		**Includes use of personal journals**		**Includes problem solving approach**	
	n (%)	Rank order	*n* (%)	Rank order	*n* (%)	Rank order
Baseline	37 (60.7)	1	30 (49.2)	2	26 (42.6)	3
Time 1	56 (65.1)	1	39 (45.9)	3	41 (47.7)	2

4.5.2 Practical assessment preferences

Question 2 asked participants to rank their preference in relation to practical assessments. At Baseline participants (61%) ranked their ability to demonstrate personal knowledge, whereas, at Time 1 participants (48%) ranked the ability to demonstrate attitude. Table 4.18 shows the results.

Table 4.18: Practical assessments and rank scores

Practical assessments	**Application of knowledge to clinical practice**		**Demonstration of skills**		**Demonstration of personal attitude**		**Demonstration of knowledge**	
	n (%)	Rank order	*n* (%)	Rank order	*n* (%)	Rank order	*n* (%)	Rank order
Baseline	*37* (60.7)	1	*31* (50.8)	2	*26* (42.6)	3	*18* (29.5)	4
Time 1	*38* (44.2)	2	*37* (43.0)	4	*41* (47.7)	1	*38* (44.2)	2

4.5.3Assessment methods

Question 3 of the questionnaire asked respondents to tick the box that they agreed or disagreed with in relation to different assessment methods. The main finding from this question relates the participants' preference for continuous assessment at Baseline (46%) and at Time 1 participants' preference for continuous assessment increased (55%). Table 4.19 shows the results at Baseline and Time1.

Table 4.19: Results from participant assessment method preferences at Baseline and Time 1.

Assessment method	Strongly agree		Moderately agree		Agree		Moderately disagree		Strongly disagree		No opinion	
Timeline	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)
Group presentations	6 (9.8)	7(8.1)	13(21.3)	11(12.8)	25(41.0)	24(27.9)	9(14.8)	19(22.1)	6(9.8)	24(27.9)	2(3.3)	1(1.2)
On line assessment	8 (13.1)	18(20.9)	21(34.4)	28(32.6)	22(36.1)	28(32.6)	9(14.8)	8(9.3)	1(1.6)	3(3.5)	0(0.0)	1(1.2)
Open book assessment	8 (13.1)	22(25.6)	20(32.8)	21(24.4)	16(26.2)	22(25.6)	13(21.3)	9(10.5)	0(0.0)	5(5.8)	4(6.6)	7(8.1)
Continuous assessment	28 (45.9)	47(54.7)	16(26.2)	23(26.7)	13(21.3)	11(12.8)	4(6.6)	2(2.3)	0(0.0)	3(3.5)	0(0.0)	0(0.0)
Peer assessment	3 (4.9)	5(5.8)	20(32.8)	21(24.4)	15(24.6)	28(32.6)	12(19.7)	17(19.8)	3(4.9)	8(9.3)	8(13.1)	7(8.1)
Composition of poetry	1 (1.6)	1(1.2)	0(0.0)	1(1.2)	1(1.6)	2(2.3)	18(29.5)	18(20.9)	38(62.3)	60(69.8)	3(4.9)	4(4.7)
Composition of songs	2 (3.3)	1(1.2)	2(3.3)	5(5.8)	7(11.5)	7(8.1)	11(18.0)	19(22.1)	35(57.4)	50(58.1)	4(6.6)	4(4.7)
Use of role play	8 (13.1)	5(5.8)	7 (11.5)	12(14.0)	12(19.7)	15(17.4)	17(27.9)	22(25.6)	14(23.0)	32(37.2)	3(4.9)	0(0.0)

4.5.4 Examination preference

Question 4 asked participants to tick the box that they agreed or disagreed with in relation to examination preferences. This identified a strong preference for MCQs and short answer examinations and a strong dislike for examinations that had essay type questions. Table 4.20 shows the results at Baseline and Time 1.

Table 4.20: Results for participant examination preferences at Baseline and Time 1

Examination type	Strongly agree		Moderately agree		Agree		Moderately disagree		Strongly disagree		No opinion	
Timeline	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)	Baseline n(%)	Time1 n(%)
Seen examination	19(31.3)	42(48.8)	15(24.6)	27(31.4)	19(31.0)	15(17.4)	2(3.3)	2(2.3)	1(1.6)	0(0.0)	5(8.2)	0(0.0)
Unseen examination	2(3.3)	5(5.8)	8(13.1)	21(24.4)	18(29.5)	18(20.9)	21(31.4)	29(33.7)	7(11.5)	12(14.0)	5(8.2)	1(1.2)
Essay type questions	4(6.6)	5(5.8)	8(13.1)	10(11.6)	9(14.8)	24(27.9)	19(31.1)	30(34.9)	19(31.1)	17(19.8)	2(3.3)	0(0.0)
Short answer questions	35(57.4)	47(54.7)	15(24.6)	20(23.3)	10(16.4)	18(20.9)	1(1.6)	1(1.2)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
MCQ	34(55.7)	69(80.2)	11(18.0)	8(9.3)	13(21.3)	9(10.5)	3(4.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
PBL	10(16.4)	7(8.1)	12(19.7)	24(27.9)	16(26.2)	27(31.4)	15(24.6)	22(25.6)	8(13.1)	6(7.0)	0(0.0)	0(0.0)
Practical examinations	39(63.9)	50(58.1)	13(21.3)	13(15.1)	4(6.6)	12(13.9)	3(4.9)	6(7.0)	1(1.6)	5(5.8)	1(1.6)	0(0.0)
Oral examination	11(18.0)	9(10.5)	11(18.0)	15(17.4)	11(18.0)	17(19.8)	20(32.8)	27(31.4)	7(11.5)	17(19.8)	1(1.6)	1(1.2)
Oral presentations	4(6.6)	5(5.8)	9(14.8)	4(4.7)	15(24.6)	18(20.9)	17(27.9)	23(26.7)	14(23.0)	33(38.4)	2(3.3)	3(3.5)
Multiple method type examination	15(24.6)	29(33.7)	19(31.1)	29(33.7)	20(32.8)	22(25.6)	5(8.2)	6(7.0)	0(0.0)	0(0.0)	2(3.3)	0(0.0)

4.6 Relationship between MI assessment preference and OSCE results

Analysis of the scores using a Kruskall-Wallis Test revealed no statistically significant differences in scores for the OSCEs and preference for practical examination at Baseline for hand washing (H=4.46; 5df; p>0.05); TPR (H=2.98; 5df; p>0.05) and BP (H=4.15; 5df; p>0.05). At Time 1 no significant differences were revealed for MI practical examination preference and hand washing (H=5.37; 4df; p>0.05); subcutaneous injection (H=8.85; 4df; p>0.05) and nebuliser therapy (H=2.71; 4df; p>0.05).

4.7 Evaluation of MITA

The participants in the experimental group (n= 46) were asked to complete a questionnaire in relation to their experiences of MITA for clinical skills teaching (Appendix 13). This relates to the research question exploring the participants' experiences of MITA. A total of 44 questionnaires were returned which represented a return rate of 95.65%.

For part I of the questionnaire, when participants rated the use of MITA, all participants either agreed or strongly agreed with all the comments. The findings are presented in Table 4.21.

Table 4.21: Rating of clinical skills teaching using MITA by experimental group

Item descriptors	*n*	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
Was well prepared for the skills class	44	-	-	-	4 (9.09)	40 (90.90)
Motivated me to want to understand the MITA approach to learning clinical skills	44	-	-	-	11 (25.00)	33 (75.00)
Was interested in helping me to understand clinical skills using MI approach	44	-	-	-	4 (9.09)	40 (90.90)
Everybody in the group was helped to understand the MI approach to teaching clinical skills	44	-	-	-	7 (15.90)	37 (84.09)
Answered all my questions when I did not understand	44	-	-	-	3 (6.81)	41 (93.18)
Related the skills teaching to real life situations using the MITA approach	44	-	-	-	4 (9.09)	40 (90.90)
Gave clear explanations of MITA approaches to the learning and teaching of clinical skills	44	-	-	-	6 (13.63)	38 (86.36)
Held my attention	44	-	-	-	7 (15.90)	37 (84.09)
Presented the information in a way that will help me learn and understand in the future	44	-	-	-	3 (6.81)	41(93.18)

Part II of the questionnaire identified the positive and negative features about the MITA skills teaching sessions, recommendations for future skills teaching sessions using MITA and any further comments that they may have had regarding the use of MITA for skills. The themes are presented in Table 4.22

Table 4.22: Positive and negative themes of MITA

Positive features of MITA	Negative features of MITA
1. Application to learning clinical skills 2. Diverse learning method 3. Environmental factors	1. Lack of practice time 2. Information overload

4.7.1 Positive features of MITA

Three primary themes resulted from thematic analysis of the data in relation to positive features of MITA. These included application to learning clinical skills, diverse learning method and environmental factors.

Theme 1: Application to learning clinical skills

Sixteen participants identified the ability to relate theory taught in the skills laboratories to clinical practice.

"I was able to apply the theory I learned from the skills classes as [name of lecturer] helped me to make a real link to the world of practice"
Participant P2

"Lessons were interesting throughout and relevant examples were always given to clinical practice which really helped my learning"
Participant G22

Fourteen participants identified the use of reflection at the end of each skills session as playing an important role in helping them internalise the skills learned.

"Reflecting and recapping at the end of each session made me focus more on what I had personally learned at the end of each session. Doing group reflection was a great way of sharing information safely and in a fun way and also helped me remember things that I may not have thought about"
Participant ID8

This is also supported by a further comment:

"The style of reflecting at the end of each session helped internalise the practical learning for me"
Participant G4

Theme 2: A diverse learning method

Ten participants recognised the diverse learning methods used by MITA as being beneficial and helpful to their learning.

"The skills were taught in an interesting way and the relaxed class with the use of music made it easier to learn"
Participant P7

Similarly it was noted

"I was more interested in learning the clinical skills with the different approaches taken by [name of lecturer] because it kept me focused".
Participant ID18

Fifteen participants acknowledged the use of the picture boards created by the lecturer as part of MITA.

"Learning using picture boards to summarise the class was really constructive".
Participant G25

The use of the picture boards was also supported by the following comment:

"Having picture boards on Moodle was a great way for me to re-cap when I went home. I was also able to look at the picture boards before my OSCE and it helped me to visualise the skill again".
Participant P36

Theme 3: Environmental factors

A third theme that emerged from the written comments included environmental factors. Fifteen participants identified the use of music as a way of promoting a relaxed environment that in turn helped reduce stress when the participants were learning their clinical skills.

"The relaxed environment and the use of music made it less stressful and so much easier to learn my skills".
Participant ID42

This theme was also evident in the following comment:

"The relaxed environment with the music playing in the background was a great idea and it really helped me to relax when I got stressed putting the skill into action under scrutiny".
Participant G15

Teacher influence and support given were recognised as important elements in helping the students learn their clinical skills. Twenty-five participants provided comments regarding this.

"[name of lecturer] is able to give key factors that influence the learning environment. [name of lecturer] is able to give great guidance and support to any student that needs it. [name of lecturer] makes every lesson interesting and answers every question asked which I believe is so important for learning".
Participant ID44

This was also supported by further comments:

"[name of lecturer] will help in anyway possible step by step. [name of lecturer] is very approachable and understanding. This helps me to learn better as I know I can ask any question".
Participant G10

"[name of lecturer] was very approachable and made sure everyone understood what they were learning".
Participant ID38

4.7.2 Negative features of MITA

Fifteen participants made comments in relation to the negative features of MITA with two themes emerging. These included practice time and information overload.

Theme 1: Practice time

Thirteen participants identified the need for repeated practice but reported that not enough time was allocated in their timetable for skills learning. This can be seen in the following comments:

"The sessions were really enjoyable, however, one class a week is not enough".
Participant G1

"I feel more practice time and clinical skills sessions would be beneficial each week"
Participant P28

Theme 2: Amount of information

Ten participants indicated that there was an overwhelming amount of information given that they needed to remember at the end of each skills session. Comments included:

"The amount of information to remember and get through when we had only a short time allocated to skills session was difficult for me".
Participant P19

"There were many skills taught but we don't get enough practice in the skills labs or out in placement and this makes it even more difficult trying to remember all the information".
Participant ID 40

4.7.3 Recommendations for use of MITA as a teaching method

This section was completed by 30 participants. Thirteen participants indicated the need for more practice being made available in the timetable. Ten participants recommended the use of music as a method of maintaining a relaxed environment as supported by the following comment:

"Keep the relaxed environment with the music in the background as it is really helped".
Participant ID30

"I really loved the approach used with MITA. I looked forward to every session as I knew it was going to be fun but I was going to learn my skills. It really encouraged me to think about what I was doing and why".
Participant G3

"Using MITA was a fun way to learn and [name of lecturer] really engaged us all in the process. I was more confident in my skills at the end of the module because I was encouraged to do it well each time".
Participant P9

The other recommendation included the continued use of reflection at the end of each skills session as it helped the participants with their learning as identified by the following statement:

"Using reflection at the end of each session made me really think about what I had to do for each skill and how I made sense of my learning for that day. I think reflection is a really good way of helping everyone to learn and to put the skills into context"
Participant P3

4.7.4 Further comments for use of MITA as a teaching method

This section was completed by 10 participants who noted that MITA helped them enjoy their clinical skills learning within the relaxed atmosphere created as exampled in the following comment:

"There was a great atmosphere created with the use of MITA and I think it should be used for all skills classes as everyone can use their strengths to learn more effectively".
Participant G16

Eight participants acknowledged the use of various forms of teaching activities with MITA. This can be seen in the following comment:

"[name of lecturer] makes a great effort to use various forms of teaching and different teaching aids to keep all the students interested and motivated".
Participant ID38

Eight participants expressed the need for having someone who was approachable and knowledgeable for the teaching of clinical skills. This is noted in the following comment:

"I think it is so important to have someone teaching you skills that is not only interested in skills teaching but can give clear, precise demonstrations. It is really important to be able to ask questions and have someone who is easy to talk to".
Participant P33

4.8 Summary of main findings

This chapter presented the main findings from the analysis of the data in the study which included:

1) OSCE results showed no significant differences at Baseline for all participants (n= 90) p>0.05. At Time 1, OSCE results showed a statistically significant difference in the three examinations (hand washing, subcutaneous injection and nebuliser therapy) (p =0.01) for the experimental group. OSCE scores for hand washing showed a statistically significant difference between the experimental and control groups at Time 1 (p<0.01).

2) The strongest ILS preference was sensing (M=1.68) followed by visual (M=1.41) preference. This was evident for both the experimental and control groups and for gender. The weakest ILS preference was intuitive (M=0.20).

3) The strongest MI preference was interpersonal (M=62.58). The weakest MI preference was naturalistic (M=39.58).

4) There was a correlation between the Multiple Intelligence of interpersonal and the learning style of visual preference.

5) Participants preferred written assignments that asked them to draw on experiences. For practical assessments participants had a preference for being

able to apply their work to clinical practice at Baseline and a preference for demonstrating attitude at Time 1. Participants showed a strong preference for continuous assessment methods. Participants had a strong preference for examinations that consisted of short questions and a strong dislike for examinations with essay type questions.

6) There were positive reports on the use of MITA especially in relation to the use of music and the relaxed atmosphere MITA generated. Participants identified that skills were taught in an interesting way that maintained everybody's interest.

In the next chapter a discussion of the main findings of the study will be undertaken.

Chapter 5 - Discussion

Introduction

The last chapter presented the study's results and their related significance to the research hypotheses, research questions and objectives. In this chapter, the relevance and importance of the study and its findings will be discussed. First, the main findings of the study, OSCE scores, ILS and MIDAS and MI assessment will be discussed. As this is an original piece of work the discussion will be linked to the literature review on learning theories, concept of intelligence, its measurement and intelligence theories. The concluding sections of the chapter focus on the theoretical and educational implications and curricula design, future research and limitations.

5.1 Sample characteristics

The distribution of gender in this study sample is broadly similar to student enrollments at the study site for the undergraduate nursing programmes in 2010. In 2010, 86.6% (*n*=78) of those enrolled were female and 13.4% (*n*=12) of those enrolled were male. The majority of nurses registered in Ireland in 2011 were female (*n*=84,595; 92.5%) (ABA 2011). This representation of females and males is also similar to that of the UK, as 91% of those registered at the start of 2012 were female nurses (NMC 2012). James et al. (2011) reported a similar distribution of females and males in an Australia study with 90% of first year nursing students being female. The distribution of gender in this study is, therefore, consistent with the gender distribution expected in many nurse education programmes and can be considered representative of the population sample. It is acknowledged that there are, however, significant differences as to the specialties in nursing in which males and females work when qualified.

5.1.1Age distribution across the sample

The distribution of age in this study is broadly similar to student enrollments in the Bachelor of Nursing Studies (Honours) at the study site in September 2009 and 2010. Overall, 65.9% (*n*=62) of those intakes were 20 years of age or under with the

remainder 34.1% (*n*=32) 24 years of age and over. The difference between the mean and median age in this study was 1.5 years indicating a normal distribution in relation to age. This also indicates that the study sample was of similar age to previous cohorts of students at the study site and, therefore, it can be considered to be representative of the population sample of nursing students.

5.2 The findings related to Objective 1

The first objective of the study was to determine if teaching clinical skills using MITA affected end of semester OSCE scores between the experimental and control groups. H_1: teaching clinical skills using MITA will have an effect on participants' OSCE scores, was accepted.

5.2.1 Baseline OSCE scores

In this study, the proficiency of a number of clinical skills was evaluated using criterion-based checklists developed by the lecturing team at the study site. There were no significant differences for OSCE scores at Baseline between the control and the experimental groups for the three skills assessed at that time namely; hand washing, TPR and BP. Participants in the experimental group achieved higher scores in all three skills examined at Baseline. However, the difference in scores was not statistically significant.

5.2.2 TPR and BP scores at Baseline

The Baseline skill performance scores for the skills of TPR were variable (range 43–100) but the mean for the control (87.82) and the experimental group (92.86) and the median scores (92.86) were relatively high. The Baseline scores for BP varied widely (range 27-100) with the mean score for the control (83.79) and experimental groups (87.68) and the median scores (86.67 v 93.33) slightly lower. The variability of the high scores achieved by the participants at Baseline may have been attributable to two factors. Firstly, the participants that achieved a low score may have been anxious about the OSCE assessment. All assessments, including the OSCE, have the potential to cause

a level of stress and anxiety (Marshall & Jones 2003; Rushforth 2006). As this was the first time that the participants completed a clinical examination under such scrutiny, it is likely that they may have been nervous about having to perform their clinical skills under such stressful conditions. As a result the stress may have interfered with their performance on the day of the OSCE. This is supported by Brosnan et al. (2006) in a study (n=88) in Ireland and Jay (2007) in a study (n=10) in England. Jay (2007) used semi-structured interviews with final year midwifery students to explore their perceptions of OSCEs. Although the students associated stress and anxiety with having to complete OSCEs, they also recognised the importance of becoming a competent practitioner and believed that the OSCE, as an assessment method, helped them to develop competency.

A second factor associated with the low scores, specifically with the measurement of BP performance, may have been due to the complexity of the skill being assessed. The measurement and recording of blood pressure is considered a complex skill for a first year nursing student (Ballie & Curzio 2009). Although the skills assessed for the OSCE were the same for all participants to ensure equity, some clinical placements may have provided the participants an increased opportunity for practice, such as the acute care setting. Participants in the psychiatric and intellectual disability disciplines may have had less opportunity to practice their skills than the participants in the general discipline due to the nature of their clinical placements. This reflects the findings from Andrews et al. (2006) who also reported that students on placement in the community or primary health care settings did not have the same opportunity to practice their clinical skills. This is also similar to findings by Ericsson (2008) who identified that providing opportunities to practice clinical skills helped improve clinical skills proficiency.

However, nearly three-quarters of the participants (74%) achieved high scores in these two OSCEs in this study. This may have been influenced by two factors. Firstly, the high scores could be attributed to the participants' preparation in advance of the OSCE. Two weeks prior to the OSCE, participants were told the skills that were going to be assessed and were given the OSCE checklists that would be used on the day of their examination. A second factor may have been the participants' ability to practice under

the supervision of a nurse lecturer prior to the examination day. This may have enhanced their preparation for the OSCEs.

These two factors reflect the findings of Byrne and Smyth (2007) in Ireland who analysed nurse educators' (n=11) experiences of using OSCEs. The two main themes that emerged from their data included OSCE preparation and the assessment process itself. OSCE preparation included students' preparation (access to marking criteria) and the assessment process (mock run). Byrne and Smyth (2007) identified that giving the OSCE checklists to the students in advance of their examination was positive as students understood what was expected of them.

5.2.3 Time 1 OSCE scores

OSCE scores at Time 1 showed a difference between the control and the experimental groups for the clinical skills assessed namely; subcutaneous injection, nebuliser therapy and hand washing. Participants in the experimental group achieved higher scores in all three OSCEs and this was statistically significant.

5.2.4 Subcutaneous injection and nebuliser therapy scores at Time 1

At Time 1 the skills performance scores for subcutaneous injection were variable (range 58-100). The mean score for the control group (90.55) and the median (92.50) were high. Similarly, the mean score for the experimental group (95.54) and the median (95.54) were high. In addition, the mean scores for nebuliser therapy were variable for both groups (range 55-100). The mean score (90.45) and the median score (92.50) for the control group were high and the mean score (95.54) and the median score (100) for the experimental group were also high.

The higher OSCE scores at Time 1 could be attributed to a number of factors. Firstly, at Time 1 the participants had completed two full semesters in college where clinical skills were taught every week and participants had also completed two clinical placements (total of eight weeks). As a result the participants may have had more time to practice and refine their skills and develop confidence in the simulated laboratory and also on clinical placement (Ackerman 2009; DeBourgh 2011). In support of this claim, Smith et

al. (2008) recognised the significance of having multiple opportunities for practice following simplified instruction to increase skills retention. They identified that failure to undertake regular training leads to poor retention of skills.

When the scores between the control and experimental groups were compared, differences were detected for the two skills. The experimental group achieved higher scores for both skills (subcutaneous injection and nebuliser therapy) and this was statistically significant. This result reflects the findings of Denny (2007) who investigated the use of MITA for teaching nursing practice theory to undergraduate nurses in Ireland. Denny (2007), using a two group control study, compared MITA with conventional teaching approaches and found that participants in the experimental group achieved higher examination results in their summative assessment. Gardner (1983) argued that, when students' MI are facilitated through improved learning, teaching and assessment practices, this can lead to improved learner outcomes and this was validated by the study findings.

A second factor that may have influenced the higher scores for the experimental group may have been the teaching intervention, MITA. MITA is grounded in constructivist approaches to teaching and learning that stress the role of prior experience and reciprocal teaching (Weber 2005). Additionally, the MITA phases show that learning is based on the experiences shared amongst learners (Weber 2005). The lecturer worked very closely with the participants in the experimental group and may have provided learning cues when explaining the procedures and during the demonstrations of the clinical skills. All participants in the experimental group had the opportunity to practice each skill in the clinical skills laboratory while closely scrutinized by the lecturer and they were given immediate feedback on their performance. The use of comments at the appropriate time has been shown to provide cues for learning (DeYoung 2003). The findings of this study support previous research in relation to the dependent variable, that is, the experimental group outperformed the control group in OSCE scores and this finding supports previous research, which found that MITA enhances student learning outcomes (Denny 2007).

The higher scores for the experimental group may have been affected by a number of variables. The lecturer worked with small groups (5-6 people) for the clinical skills sessions and this may have had an impact on the amount of time each participant was given, as well as the development of a working relationship with participants in the experimental group. Therefore, adopting a student-centred approach to teaching the clinical skills may have been the catalyst for learning as each participant could identify their personal learning needs and demonstrate their understanding of their clinical skills learning (Weber 2005). Having identified the participants' learning style preference and MI preference at Baseline, the lesson plans were developed accordingly. It is not clear if the participants in the experimental group knew their clinical skills better on the day of their OSCEs and, hence, the higher scores, or whether they had developed a more in-depth knowledge of their clinical skills, overall, through the use of reflection and, consequently, could adapt better to the OSCE as a method of examination. Nevertheless, the lecturers working with participants in the control group had equally small classes and, therefore, those participants had similar opportunities to achieve high scores.

A third factor that may have increased the OSCE performance scores for the experimental group was the use of visual aids, which is one of the many teaching and learning strategies used with MITA. While all participants in the control and experimental groups had access to the same online DVDs for the skills taught, the participants in the experimental group were provided with picture boards, posters and illustrations from a whiteboard, developed specifically for each skill. Participants in the experimental group had a higher mean score for visual learning style preference than the control group and this could have been an influence in their preference for using visual aids for learning (Mayer 2001). Participants had an opportunity to take photographs of the whiteboard to use for learning and for revision purposes prior to the OSCE. The use of visual aids, such as the picture boards, posters, photographs or illustrations from the white board have been found to enhance learning because they enhance mental representations or schemata (Piaget 1981; Arguel & Jamet 2009). Mayer (2001) supports this contention and suggests that learning is enhanced when visual aids are used by educators to improve recall of information, as opposed to using text only format.

Arguel and Jamet (2009) suggested that the combination of reflection and the use of visual imagery may have helped the participants in the experimental group to internalise clinical skills learning and, hence, the increase in OSCE scores. In phase five of MITA, participants were given time for reflection, personally and as a group, at the end of each skills session. Weber (2005) suggested that reflection should be used to encourage learners explore topics for deeper understanding and to avoid stagnation in learning (See Table 2.5, p.47). During this reflection time the participants used a whiteboard to draw or write about elements of their personal learning. These reflections were subsequently discussed with the group and the lecturer to further stimulate and develop student learning in relation to clinical skills. In addition, reflective practice, as evidenced in the literature (Butterworth et al. 2008), enables students to extend their critical abilities and subsequent critical thinking skills, which are prerequisites for competency in nursing practice.

5.2.5 Hand washing scores at Baseline

At Baseline the hand washing skill performance scores were very similar for both groups (range 73-100). The mean score for the control group (90.15) and the median score (86.67) were high while the mean score for the experimental group (92.17) and the median score (93.33) were also high. The high scores achieved by the two groups for hand washing may have been due to a number of reasons. Firstly, from a nursing perspective the skill of hand washing is not considered a complex skill. Hand washing is a skill that is used in many nursing and patient care situations and is also used in a social context. Additionally, hand washing is a skill that is learned from a young age (Whitby et al. 2007). Therefore, the participants may have been very familiar with components of this skill but they may not necessarily have learned the skill of hand washing in the sequence taught and required in nursing practice. As a result, learning this skill may not have been considered too difficult for the participants. Gagne (1985) described two types of conditions necessary for the learning of motor skills; internal and external. He identified the internal conditions as the existing capabilities of each learner required for learning and the external conditions as the environment required for learning, the teacher and the learning situation. Another factor influencing the high scores may have

been that the participants had returned from a short clinical placement (3 weeks) at the time of the OSCE. This would have provided the participants the opportunity to practice the skill of hand washing on a number of occasions while working in the clinical areas under the supervision of their preceptors and is consistent with findings of Cole (2009) and Kennedy and Burnett (2011).

5.2.6 Hand washing scores at Time 1

Overall, the scores for hand washing at Time 1 had increased from Baseline for the control and the experimental groups. When a comparison of the scores was undertaken between the control and experimental groups at Time 1, a variation in scores was identified. Participants in the experimental group achieved higher scores for hand washing and this was statistically significant. Although the effect sizes for both the experimental and control groups were considered large, the experimental group demonstrated greater eta-squared values (0.40), indicating a medium effect size.

The range of scores for the control group widened at Time 1 (range 53 – 100), but the mean (94.85) and the median (100) scores were increased from Baseline. A possible suggestion for this wide range may have been complacency and poor compliance with the execution of the skill (Pittet 2000; Randle et al. 2006; Cole 2009). In the UK, Cole (2009) carried out a mixed methods study with senior nursing students (n=147) to explore hand hygiene compliance. Cole (2009) concluded that participants over reported their compliance with hand washing because of the perceived importance of the skill in health care. In an attempt to reduce complacency with hand hygiene, Cole (2009) suggested that educators encourage nursing students to engage with reflection to help them gain an increased insight into the performance of such skills, especially hand washing. Reflection was not used by the lecturers with the control group at the end of each clinical skills session. As a result, the learning of this key skill may not have been reinforced, whilst in the experimental group, Phase five of MITA centres on student reflection.

The scores for hand washing for the participants in the experimental group increased at Time 1 (range 80 – 100) and the mean (98.41) and the median (100) scores were also

significantly higher than at Baseline. These high scores are reassuring as hand washing is the most effective measure in the prevention of hospital acquired infections (Randle et al. 2006). The high scores at Time 1 for the experimental group may have been attributable to a number of factors. Participants in the experimental group carried out the skill of hand washing before and after each skills session in the skills laboratory where they were observed each time for correct performance by the lecturer and were given appropriate feedback. This finding compares with Jeffrie's (2005) study, which identified that extensive practice under supervision helped with improved precision and execution of the skill and that the provision of appropriate feedback helped reinforce learning. Moreover, Fitts and Posner (1967) identified the need for repeated practice to achieve the autonomous stage in their model, while Gagne (1985), in his stages of learning, recognised that repeated practice under supervision was needed for skill development.

Another factor leading to the increased scores may have been the multi-modal approach used with the MITA. Using MITA facilitates a multi element approach to teaching and learning and may, for example, use problem based learning, constructivist approaches, reflective learning and where necessary didactic teaching (Vygotsky 1978; Weber 2005; Denny et al. 2008). MITA promotes an approach to teaching and learning that is systematic and structured (Weber 2005). In addition, MITA uses brain based approaches to teaching and learning and, therefore, adds cogency to deep learning processes (Weber 2005; Denny 2007, 2008, 2010).

The findings of this study are, therefore, consistent with a number of studies reporting that multi modal approaches to teaching the skill of hand washing can improve skill performance (Trick et al. 2007; Bloomfield et al. 2010). A prospective observational study in the USA (Trick et al. 2007) identified the use of multi-modal education, that is, using multiple approaches to facilitate teaching and learning, which included the use of posters. Trick et al. (2007) found that this had a positive impact on hand hygiene compliance with health care workers. Trick et al. (2007) undertook their study over three years in four hospitals (three intervention hospitals and one control hospital). They reported that, following intensive educational training sessions and use of posters

in the clinical areas, there was increased hand hygiene compliance that was sustained over a three year time frame. In the current study, the participants in the experimental group were directed to the hand hygiene posters in the skills laboratory and these posters were also made available through the college CMS for participants in the experimental group.

Similarly, Bloomfield et al. (2010) in the UK, used a RCT with nursing students (n=242), to compare the effects of computer assisted learning (CAL) and conventional teaching for the skill of hand washing with data collected at four time points. Participants in the experimental group worked independently through a self-directed CAL module that took place in a computer room on-campus. Participants in the experimental group also had access to a number of interactive activities that included animated multimedia, photographs and links to web sites as well as an instructional DVD for hand washing. Participants in the control group were taught the skill of hand washing in the skills laboratory by a team of nurse lecturers, had the opportunity for practice, had access to a video of hand washing and also had access to additional reference material. Bloomfield et al. (2010) reported that participants in the experimental group achieved a higher median score at a two week and an eight week follow up, for the hand washing skill performance scores. Bloomfield et al. (2010) suggested that this increase in scores was due to students' increased knowledge and understanding of the skill of hand washing. The method of teaching, namely CAL, was also considered an effective approach to teaching the skill of hand washing. MITA and CAL (Bloomfield et al. 2010; Karaksha et al. 2011) have a number of similarities, such as multimedia features, visual aids, the use of photographs, posters and imagery, which are all used in the MITA approach.

Phase five of MITA includes a reflection phase. Participants in the experimental group were provided with time at the end of each skills session, individually and as a group, to explore their clinical skills development and to enhance self-awareness (Weber 2005). The What? Model of Structured Reflection (Driscoll 2000) was used at this time to probe the participants' understanding of their learning, to analyse their performance, to provide strategies for improvement and to set new learning goals. Using a reflective

process encourages participant engagement in the learning process, improves understanding and promotes problem solving (Rose & Best 2005). Weber (2005) noted that when reflection is not used it leads to stagnated learning (See Table 2.5, p.47). Reflection is essential to nursing practice and if it is not facilitated, both in education and practice, then a nurse's ability to critically reflect on practice issues results in incompetent performance (Funnell et al. 2008).

The use of reflection for learning has been previously reported in studies conducted with nursing students. Hatelevik (2011) found that reflection helped bind theoretical knowledge and practical skills and, therefore, helped to bridge the gap between theory and practice. She suggested that a level of theoretical knowledge and practical skills is advantageous in the development of reflective practice, in early nursing education. The use of reflection in phase five of MITA is, therefore, considered the conduit for linking theory and clinical skills practice. This may be one reason why OSCE scores were higher for the participants in the experimental group at Time 1.

The difference in scores for hand washing for the control and experimental groups at Baseline and at Time 1, could best be explained by the theoretical framework of Fitts and Posner's Theory of Motor Learning (1967). This three stage model, as discussed in chapter two, considers the cognitive, the associative and the autonomous stages for motor skills learning. During the cognitive phase the new learner considers the basic task involved with the skill and this stage is often marked with a number of errors in performance. During the cognitive stage the learner needs support and needs to be provided with specific information as to their development and performance. As the learner accumulates practice and experience, they develop their skills and begin to recognise their errors. This stage is known as the associative stage. At Baseline, the OSCE scores for hand washing for the control and the experimental groups were high and the results were not statistically significant. At Baseline, it was considered that the participants had reached the associative stage, because of the variability of the performances and scores. At Time 1, all scores had increased and the scores for participants in the experimental group were statistically significant. It could be suggested that a large number of the participants had reached the autonomous stage,

where, following repeated practice they could perform the skill in a smooth and skillful manner (Fitts & Posner 1967). However, the wider range of scores for the control group could be an indication that they had not all reached the autonomous stage of skill development at Time 1 for the performance of hand washing.

5.3 The findings related to Objective 2.

Objective 2 of this study sought to identify if there was a relationship between learning styles preferences and MIDAS IS preferences. This was measured using the ILS and MIDAS IS profiling questionnaire. The experimental group had the highest scores for the learning style preference of '*sensing*' and the Multiple Intelligence preference of '*interpersonal'*. This was the same for the control group with minor variances. The H0 stated that teaching clinical skills using learning styles preferences would have no effect on participants' OSCE scores. The H0 hypothesis for ILS was accepted by the results.

The four dimensions of learning described by Felder and Silverman (1988) were represented in this study, as the majority of participants identified a '*sensing*', '*visual*', '*sequential'* and '*active*' learning style preferences. This suggests that the study participants enjoyed working in groups and wanted to have concrete information presented to them in an incremental and visual manner and were good at problem solving. These findings correspond with existing evidence that suggests the process of learning is influenced by a number of factors (Astin et al. 2006; Rasool & Rawaf 2008; McChlery & Visser 2009). An individual's learning orientation is influenced by personal learning style preferences in relation to information processing and is further affected by approaches to teaching and learning (Denny 2007; Goldfinch & Hughes 2007).

This study found that the overall dominant learning style was the '*sensing*' style. According to Felder and Brent (2005) people with a learning style preference of '*sensing*' want to be presented with concrete facts and to solve problems based on these facts. This result was not surprising considering the young age group of the majority of the participants in this study, who had come to third level education directly from

school. Hyland (2011) argues that the secondary school educational system in Ireland, involves memorization and rote learning and these factors may have had an influence on the '*sensing*' learning style preference in year 1.

In an Australian pilot study, Wetzig (2004) with staff nurses in intensive care (n=20), identified that the majority of participants showed a preference for the '*sensing*' learning style preference. However, Weitzig (2004) commented that the teaching strategies used for students undertaking the structured learning programme for intensive care nursing, had a bias towards sensing learning strategies because of the need to deliver concrete facts necessary for the care and management of people in an intensive care environment. This may also be a reflection of how nursing programmes are delivered worldwide as there is an emphasis placed on factual learning and the practical application of this material (Banning 2005; Pettigrew et al. 2011). However, it is suggested that nurses need to be encouraged to develop more abstract thinking skills if they are to practice effectively in the complex world of health care. For this to happen, nurse educators must depend on and use effective educational theories that are current and relevant.

The second highest learning style preference in the current study was '*visual*'. The study participants had come from a mixture of educational and cultural backgrounds, from urban and rural areas and there were a mix of school leavers and mature entrant applicants. Some of these factors may have had an influence on the results. In Ireland, lecturing as a method of teaching is the strategy employed in most secondary schools and third level colleges. The use of power point presentations and media for delivery of course content is very popular as well as the use of reading material for supporting classroom work (Race 2005). In nursing, the use of practical demonstrations for clinical skill development is widely used to support learning and this approach contains a strong visual element, as discussed by Weitzig (2004).

This result is similar to findings from an Australian study conducted by James et al. (2011), where it was highlighted that '*visual*' learning style preference was second highest for a group of first year nursing/midwifery students (n=334). James et al. (2011) used the '*visual*', '*aural*', '*read/write*' and '*kinaesthetic*' (VARK) model to identify the learning style preference. In contrast, another Australian study by Koch et

al. (2011) using VARK with a group of first year accelerated graduate entry nursing students (*n*=62), found that '*visual*' learning style preference attracted the lowest score. Koch et al. (2011) suggested that one possible explanation for this finding was that study participants had previous experience with academic programmes and consequently were exposed to various teaching and learning modalities, which may have accounted for not prioritizing visual learning as important.

The fact that the majority of participants in this experimental group scored highest for '*sensing'* learning style preference (orientation towards concrete facts and procedures) and second highest for '*visual*' learning style preference (use of DVDs, coloured picture boards, graphics from the white board) indicates that the multiple approaches used with MITA were possible influences that enabled improved learning for this group. Furthermore, the use of demonstrations and interactions, as used during MITA classes, is an important part of the learning process for those who present with these learning style preferences.

In this study the learning style preference of '*sequential*' scored higher than '*global*' learning style preference. Currently, education is delivered in the secondary school system in Ireland in a sequential way as the curriculum is broken down and delivered in small portions (Moonie Simmie 2010). Therefore, this may have influenced these first year participants in their responses to the ILS questionnaire. Learners who present with a '*sequential*' preference learn best when new material is presented in a logically ordered progression (Felder & Spurlin 2005). This finding is consistent with findings from Weitzig (2004) who identified the need to use case studies and '*real life'* situations to support learning and to relate new information and concepts to existing knowledge and the real world of nursing practice. In this regard, MITA, as a method of teaching and learning, presents information in a way that builds on past knowledge and learning experiences and links are made to prior learning which promotes new learning. This happens through the process of actively engaging the students in the classroom (Weber 2005).

'*Active*' learning style preference scored higher than '*reflective*' learning style preference in this study. This is consistent with findings from previous studies that

identified '*active*' learning style preference (Graf et al. 2007). A study of undergraduate students (*n*=207) enrolled in web engineering and information technology in New Zealand and Austria (Graf et al. 2007) identified that those students that preferred an '*active*' learning style achieved higher scores than participants who preferred a '*reflective*' learning style. They suggested that students enrolled in programmes, such as engineering, learn best when they can apply new information in an active manner, for example, in laboratories (Graf et al. 2007). It could be argued that nursing practice is concerned with the practical application of nursing knowledge, for example, clinical skills learning. This could indicate that learners with an '*active*' learning style preference need to have time for clinical skills practice and, therefore, this aspect of teaching and learning time should be incorporated in nursing curricula. Weber (2005) also contended that MITA enables active uptake of knowledge and movement away from the passivity of didactic approaches to learning that fail to engage the learner.

This finding, however, differs from the results of a study of undergraduate nursing students (*n*=192) (Cavanagh et al. 1995) in England, who used Kolb's (1985) Learning Style Inventory. The investigation found that an '*active*' learning style was the least preferred method of learning with a preference for a '*concrete*' learning style, whereby, learners organise small pieces of information into a meaningful whole piece. Similarly, another English study (Aistin et al. 2006) found '*active*' learning style to be the least preferred learning style amongst a group of qualified Macmillan clinical nurse specialists (CNS) (*n*=137) using the Learning Styles Questionnaire (Honey and Mumford 2000) and instead the dominant learning style of the CNS was that of *'reflector'*. This is, perhaps, consistent with the role of the CNS as they provide education and training to patients and other staff members and tend to have good listening skills.

Felder (1983) has shown that '*active*' learners understand new information when they engage with a form of experimentation with new information. In order to be at the level of '*active-experimentation'* (Kolb 1984), the learner needs to develop the skill of problem solving and decision making. It is argued that the majority of participants in this study were in the younger age group and, therefore, liked to use classroom time for

discussion and exploration of theoretical content that related to clinical skills teaching, as opposed to being reflective (Armstrong 2009). This may mirror the system of education that they were previously exposed to in secondary school (Moonie Simmie 2010). Older students often have better reflective abilities because of past experiential knowledge and possibly more formal knowledge and maturity. Having a group with mixed levels of reflective experience and ability enabled transfer of knowledge, specifically in this study, as MITA facilitated intrapersonal reflection and interpersonal group reflective activities.

5.3.1Multiple intelligences development assessment scale

HO_1 stated that teaching clinical skills for MI preferences using MITA would have an effect on participants' OSCE scores. The HO_1 was supported in this study. The results from the MIDAS MI profiling for the experimental and control groups showed that interpersonal intelligence was rated as the highest intelligence. This finding supports existing evidence that interpersonal intelligence scored highest for people undertaking a health care related programme (Shearer 1999; Shearer 2004; Denny 2007). The study participants were nursing students, a profession which demands good interpersonal skills and effective communication and this could have led to a high preference in interpersonal intelligence. Peplau (1991: p.5) in her work defined nursing as an "…*interpersonal process*" where human relationships are essential to developing a therapeutic relationship between the nurse and the patient. Peplau (1991) further identified the need for nurses to develop empathy as this contributes to excellence in nursing care. Empathy has been found to be an essential skill for interpersonal MI development. The importance and quality of a genuine human encounter is considered to be a central component for the development of empathy in the nurse – patient relationship and is considered one of the central elements of interpersonal intelligence (Williams & Stickley 2010). In the context of nursing education, the development of interpersonal intelligence can take place in the clinical skills laboratory with the use of appropriate simulation.

Further examination of the results identified intrapersonal intelligence as the next highest MI preference for all participants. Having a high score in intrapersonal intelligence includes an understanding of self-knowledge and personal strengths, limitations and self-confidence (Gardner 1993; Gardner 1999; Denny 2007). Students with high intrapersonal intelligence have been known to work well with independent study and short reflection periods (Armstrong 2009). In an Irish study (O' Connor & Brunton 2003) exploring multiple intelligences preferences, conducted among first year undergraduate nursing students (n=60), intrapersonal intelligence achieved the highest score. As the majority of participants entering the nursing programme had just finished secondary school this result is not unexpected. Nursing is identified as being a course that requires high entry requirements and, therefore, the participants had to be motivated and determined to achieve this requirement (CAO 2012). As a result, nursing students are more likely to have a strong sense of purpose because they are used to working on their own for personal study to achieve such high entry requirements. Brunton and Jordan (2006) identified that these participants are aware of their personal abilities to develop, how to achieve their potential and are intuitive about what they learn and how it relates to them personally.

People who work in the caring profession require high intrapersonal intelligence because they must also be able to interact effectively with the public and demonstrate good staff client relationships (Shearer 2004). The development of intrapersonal intelligence allows the health care provider, for example a nurse, to understand people, how to work with them and how to motivate them (Ramsey 2001). It must, however, be noted that the participants in the current study scored quite low for reflection when they completed the ILS. The use of reflection is considered important for the development of intrapersonal intelligence because it leads to a strong self-awareness (Gardner 1999). Therefore, this would appear to contradict the findings of a high score in intrapersonal intelligence.

All study participants achieved a moderate to high score (achieving a score above 50) for linguistic intelligence according to the MIDAS profiling. Linguistic intelligence identifies the ability to use language effectively, either written or spoken in a given

situation (Gardner 1999). One of the outcomes from a programme of nurse education is to develop communication skills, both verbal and written, of the people undertaking the programme so that they can deal effectively with the people they care for (De Young 2003). It was expected that linguistic intelligence would score higher given the intimate nature of nursing care and the need for effective communication. It could be argued that the participants in this study were novices to nursing and when they completed the MIDAS profile they had very limited or no experience of working in the clinical area.

The participants in this study were very familiar with a system of lecturing in the classroom where information is explained and then the participants read about the subject matter in books or using the Internet (Hyland 2011). It could be said that the participants in this study have grown up in a technological and multimedia era and are familiar with interacting with computers and media for learning and collaborating with their peers in the use of this technology (Maag 2006). In relation to linguistic intelligences, the results from this study differ from the findings of an Irish study (Brunton & Jordan 2004) conducted with first year undergraduate students (n=70) (including nursing students) as linguistic intelligence had the lowest score. Linguistic skills are considered essential for learning and developing critical thinking and improving work practices (Perin 2002). It is encouraging that the participants had moderate to high scores for linguistic intelligence in this study because effective verbal and written communication abilities are needed in nursing for interaction with the people they meet and care for and for use in collaboration with other health care professionals (Shearer 2004; Denny et al. 2008).

The study data showed that logical-mathematical intelligence scores were low for both groups according to the MIDAS profiling. The control group had a slightly lower score than the experimental group but this was not statistically significant. This finding is similar to findings of Denny (2007) who identified that mathematical intelligence for nursing students (n=45) was not a dominant intelligence. A study in the USA (Polyfroni et al. 2003) found poor mathematical skills of new nursing graduates which they attributed to the inappropriate teaching of maths in the secondary school system.

Similarly, a quasi-experimental study conducted by Glaister (2007) in Australia with second year nursing students (n=97), explored the effects of attitudes to maths and computers as well as mathematical testing anxiety in relation to drug dosage calculations. The results showed that nursing students were anxious in relation to mathematical knowledge as 20% (n=19) identified a problem with maths. A further 14% (n=13) demonstrated high levels of anxiety with tests related to mathematics while the use of computers also caused concern for the students (n=11). Glaister (2007) suggested that, when students lack confidence in their abilities, such as solving mathematical problems, a learning approach and infra-structure which provides the necessary support benefits the student. The use of MI teaching and learning approaches can assist students of all abilities and help them to develop their weaker intelligences, such as logical-mathematical (Weber 2005).

Logical-mathematical intelligence is also associated with problem-solving abilities, logical questioning and the investigation of scientific issues (Gardner 1999). Nursing students must be able to apply logical reasoning to everyday problems (Armstrong 2009). Having good problem solving and calculation skills is an essential mix for solving drug calculations issues in nursing (Wright 2008; Røykenes & Larsen 2010; Wright 2012). Developing the participants' skills in relation to exploring patterns and relationships and in identifying cause and effect relationships is beneficial for nursing students (Denny et al. 2008). Furthermore, nursing students are required to calculate drug dosages safely and effectively and also increase patient compliance with medication use. Consequently, developing students' logical-mathematical intelligence might also increase such necessary skills required in nursing.

Naturalistic intelligence relates to recognition and classification of the natural environment (Gardner 1999). From a nursing perspective, naturalistic intelligence relates to the ability of the nurse to identify the environmental conditions that are conducive to healing, to develop pattern recognition in medical and nursing conditions and to be aware of the difference between care in the home, community or hospital setting (Suk et al. 2003; Phaneuf 2006; Denny et al. 2008). From a holistic nursing perspective, the influence of the natural environment is considered important, as nurses

are expected to recognise and understand environmental conditions that affect health and health related issues. Developing these skills with nursing students requires consideration when teaching students and MITA facilitates naturalistic intelligences that support the above contention (Gardner 1983). The research of Potter et al. (2005), who analysed the work of nurses, using a longitudinal observational study, found that environmental factors play a significant role in patient safety. The use of MITA in clinical skills teaching and learning is one way in helping students to increase their naturalistic intelligence and, hence, improve the delivery of safe nursing care (Weber 2005).

The study data showed that participants scored lowest for naturalistic intelligence in both the experimental and control groups. Perhaps this finding highlights the lack of clinical experience that these students had when they completed the MIDAS profile, as well as their lack of ability to recognise patterns of care at such an early stage in their nursing education. This low score in naturalistic intelligence is similar to findings of an Irish study (O' Connor & Brunton 2003) with first year students (n=359), including nursing students. Using a 90-item multiple intelligence inventory, they found naturalistic intelligence had the lowest score. Similarly, an American study (McClellan & Conti 2008) identified naturalistic intelligence as the lowest score among a group of adult students in a Community College (n=874) using a 45-item multiple intelligences survey (MIS). In contrast, Denny (2007) found naturalistic intelligence as having a higher preference at pre-test in a study exploring the use of MITA for teaching theory to second year nursing students.

5.3.2 Intellectual style results

Results from this study identified no significant differences between the experimental and control groups regarding intellectual styles. Leadership style intelligence was identified as the highest IS followed by general logic and innovation for the two groups. This supports the findings from Denny (2007) who found the same pattern in her study when the multiple intelligence profile of nursing students was measured at pre-test. At

post-test, Denny (2007), found an increase in innovation scores and suggested that this could be as a result of the method of teaching employed, MITA.

Analysis of the study data showed that leadership intelligence received the highest score for participants in both the control and experimental groups. Leadership intelligence takes into account the person's ability to organise and solve interpersonal problems in relation to management and supervision and places an emphasis on communication and teamwork that is considered an essential skill in nursing (Shearer 2004). The high score for leadership style intelligence indicates nurses who are capable of organizing and solving problems, an essential quality for the delivery of health care in the future (Shearer 2004).

General logic style scored second highest for all the participants in this study. General logic indicates a preference for solving practical problems on a daily basis (Shearer 2004). This finding is consistent with Denny's (2007) study. As nursing is facing many global challenges, such as, economic problems and staffing shortages, having a high general logic ability bodes well for graduates as it is valuable asset to possess in relation to health care organisational management processes.

Innovation style achieved the lowest score among all participants and this is similar to findings by Denny (2007). This style indicates a leadership style that focuses on imaginative over practical solutions to problems that may arise and the ability to solve problems in unique and innovative ways. Shearer (2004) asserted that, if participants achieve high scores in these three intellectual styles (leadership, general logic and innovative), it increases the likelihood of them progressing very well in that chosen career. For that reason the MIDAS IS profiles offers a guide to a person's intellectual styles.

5.3.3 Relationship between learning styles and MIDAS IS profiling.

The results from this study indicate the need to be aware of the many different learning styles, abilities and dispositions of the students undertaking an educational programme

in nursing. It is beneficial that educators create a learning environment that actively engages the learner and help them develop critical thinking skills, problem solving skills and communication skills (Weber 2005; Denny et al. 2008). In this study the learning style of '*sensing*' and the MI of '*interpersonal*' were found to be related. The mean age (M=21.73) of the participants could be a contributing factor to the above findings as the majority of participants have left a school system where didactic teaching was the main approach (Hyland 2011). This relationship may also have been influenced by the method in which concrete facts were presented in the classroom and the way in which problems were solved based on the information presented with the assistance of the educator. It is recognised that a combination of learning styles and multiple intelligences can work together effectively to form a model of learning that in turn can lead to a deep approach to learning (Baeten et al. 2010).

5.4 The findings related to Objective 3.

The third objective of this study was to determine if there was a relationship between learning styles and MIDAS IS profiling and OSCE scores between experimental and control groups.

As previously identified, the findings from this study found that the majority of participants had '*sensing*', '*active'*, '*sequential'* and *'visual'* learning style preferences. These preferences suggest that learners like to solve problems in relation to the information presented, to put information into practice, to learn in incremental steps and by seeing things done, so that they can demonstrate clinical skills effectively. The findings from this study showed that there was no statistically significant relationship between learning styles and OSCE scores.

In relation to MI preferences, findings from this study showed that there was no statistically significant relationship between MI preference and OSCE scores. The OSCEs in this study measured the participants' abilities at the "*shows how*" level of Miller's pyramid (1990). Kinaesthetic and spatial intelligence are considered the multiple intelligences to be more closely associated with skill performance (Shearer

2004). Learners with these MI preferences have specific skills such as good co-ordination, dexterity, flexibility and have the ability to visualise relationships between space and form and can recognise fine details (Gardner 1999). Kinaesthetic and spatial intelligences were not found to be the dominant MI in the experimental or control groups, whereas, in Denny's (2007) study, repeat measures indicated that preference for spatial intelligence increased over the longitudinal aspect of the study.

Results from the two-way ANOVA test found that there was no relationship between learning styles, MI profiling and OSCE scores at Time 1 for either the experimental or the control groups. Therefore, participants with a particular learning style or particular MI profile did not have greater learning performance in their clinical skills, which suggests that the OSCE scores at Time 1 were more likely to be as a result of the method of teaching, MITA. This means that teaching and learning, using MITA, can enhance the learning experience for students with disparate intellectual dispositions or learning preferences (Denny, 2010).

5.5 The findings related to Objective 4

Objective 4 explored the relationship between the preferred method of MI assessment and OSCE scores. The findings showed that there was no significant relationship between MI assessment preferences and OSCE scores. H0 stated that teaching clinical skills for MI assessment preferences would have an effect on participants' OSCE results. This hypothesis was not supported by the results.

In relation to written assessments, participants in this study showed a strong preference for work that drew on their personal experiences to demonstrate their learning. This suggests the desire to have assessments that are relevant to real life work situations. Bengtsson and Ohlsson (2010) considered the use of prior knowledge as an important motivator for learning. One explanation for this preference could be that nurse educators often draw on personal clinical experience when teaching nursing care problems encountered in the clinical area (De Young 2003). This is in keeping with the theory of adult learning developed by Knowles (1990), who identified the desire of

adults to bring life experiences and knowledge to specific learning experiences. Knowles (1990) also recognised that adult learners may, however, need help connecting these experiences and that this can be facilitated by the educator. Participants in the experimental group were helped explore these connections during reflection time in the MITA led sessions.

At Time 1 the preference for having written assessments that draw on clinical experiences could have been influenced by participants having returned from clinical placement when they completed the questionnaire at Time 1. This was demonstrated by the rise in scores from Baseline to Time 1. This finding supports existing findings from a study conducted by Amin et al. (2011) with a group of undergraduate medical students. They found that students preferred assessments that measured their understanding and application of clinical knowledge. This could be aligned with a constructivist learning approach as exposure and work in the clinical area helps build a connection and confidence with theory taught in the classroom and the practical experience gained at clinical level (Vygotsky 1978; Vandeveer & Norton 2005).

This finding also compares favorably with a Dutch study undertaken by van de Waterling et al. (2008) with first year students from a number of faculty (n=765), who identified a preference for written assessments. As an assessment method, students thought they could prepare better for a written assessment because they could use supporting material such as books and notes and this in turn reduced their stress and anxiety. In the current study it could, however, be argued that participants chose written assignments that drew on their personal experience because it is a method of assessment that they were familiar with (Hyland 2011).

At Baseline, participants indicated a stronger preference for practical assessments in which they could apply their knowledge. This response may have been chosen because participants thought that is what was to be expected of them for their practical examination. In addition, when participants completed the questionnaire at Baseline, they only had experience of learning skills in a simulated environment. Theoretical knowledge in relation to each skill was discussed in class and during the skills session. At Time 1 the participants had a change in opinion as they expressed a stronger

preference to being able to demonstrate their personal attitude to the subject matter being examined. At Time 1 the participants had spent a total of eight weeks in clinical placement and had the opportunity to practice their clinical skills in the clinical environment and this may have led to a change in opinion.

When the participants were asked to express their preferences for assessment methods in the current study, they identified continuous assessment as their strongest preference at Baseline and also at Time 1. This is similar to Trotter (2006) in the UK who explored the effect of continuous assessment in relation to behaviour and the learning environment of students (n=69) undertaking a BSc. (Hons) in finance and accounting. Having conducted a questionnaire (n=69) and semi-structured interviews (n=8), Trotter (2006) identified that the use of continuous assessment had a positive impact on student motivation as it encouraged the students to complete work on a regular basis. However, she also concluded that it had a negative impact on student motivation due to the amount of work that was generated by such modes of assessment and this impacted negatively on their learning.

Studies indicate that continuous assessment is favoured by people who do not perform well in examination (Suk et al. 2003; Furnham et al. 2008). This can be influenced by the participants' preferred method of learning or their personal MI strength as evidenced by Armstrong (2009). Therefore, a combination of assessments identifying individual strengths over a period of time is important for these learners (Denny 2007). Importantly, educators should look at the overall workload of all elements of a curriculum so that there is a focus on the quality of the learning experience (Race 2005).

The use of song and poetry as a form of assessment scored low both at Baseline and Time 1. This form of assessment is not a method that the participants in this study would have had very much experience of in the past. Musical intelligence scores were also low overall, for this group but linguistic intelligence scored higher. Unfortunately, the way in which poetry is taught to students in second level in Ireland may have had an influence on this result as participants had to learn poetry verbatim in contexts in which they may not have had any interest (Hyland 2011). Music, on the other hand, is much more expressive and more readily available.

Music has also been shown to improve concentration and reduce stress levels in the classroom (Amerson 2006; Dosseville et al. 2012). This was evident in the current study with the use of music in the clinical skills laboratory for the experimental group (MITA). Although level of stress was not measured specifically, a calm atmosphere was evident in the skills laboratory and participants worked well as a team for clinical skills sessions. The participants reported the use of music positively when they evaluated the use of MITA.

Findings for examination preferences were varied. Participants at Baseline showed a strong preference for examinations that had short questions followed very closely by examinations with multiple choice questions. These examination methods may be associated with rote or surface learning approaches, as students may attempt to memorise all the details of lessons and then replicate all the facts for the purpose of an assessment (Biggs et al. 2001). This finding supports other research findings, which suggest that students learn that attainment of higher marks in examinations can be achieved by rote learning (Bengtsson & Ohlson 2010). There are, however, other mediating factors, such as, the workload for the semester and limitations of a modular and semesterised system of education (Sand-Jecklin 2006). Therefore, when planning assessments, educators should try to find an appropriate assessment method as well as appropriate pacing of assignments (Freeman & Lewis 2002; Struyven et al. 2005).

At Time 1 participants showed a stronger preference for MCQ examinations and there was also an increase in preference for examinations with short questions. This finding is inconsistent with a study in the UK (Furnham & Chamorro-Premuzic 2005) with undergraduate students (n=103) that identified students who had a higher IQ score preferred MCQs as a method of assessment, whereas in this study participants did not score high in g intelligence and yet preferred MCQ assessment methods. They also identified that the type of assessment method was linked to a particular academic discipline and suggested that students undertaking science courses were more in favour of MCQs. Furnham et al. (2008) in another study carried out with undergraduate students (n=430), in four universities in America and the UK, found a clear preference for MCQs while also identifying a strong preference for continuous assessment.

Furnham et al. (2008) found that students who adopt a surface approach to learning clearly favour the use of MCQs due to "*simple recognition*" of the answer. This is similar to findings of Nighuis et al. (2008) and supports the view that a surface approach to learning has been found to be incompatible with long term academic success because the recall of information is short term.

Similarly, a Dutch study by van de Waterling et al. (2008) with first year students (n=765), demonstrated a preference for MCQs for similar reasons to Furnham et al. (2008). However, van de Waterling et al. (2008) found that there was no relationship between assessment preference type and scores on the different cognitive levels. A misperception between students' approaches to learning and assessment was also reported which has implications for how assessments are selected. As participants in the current study had been through one examination cycle with a range of assessments, perhaps the use of MCQs and short questions were considered more favorable. The challenge for educators, including nurse educators, is to have MCQs and short questions that are well designed and that incorporate more vignette style questions that seek to ascertain deeper approaches to learning and, therefore, test higher level skills (Race 2005; Yonker 2011). Vignettes are considered useful in nursing education as they help the learner identify the necessary elements for resolving problems.

The results from this study indicate that at Time 1 participants did not like examinations that used essay type questions. This is in contrast with Furnham et al's. (2008) findings that showed that students who had a deep approach to learning preferred examinations with essay type questions, because this allowed them to demonstrate their level of knowledge. Using unseen essay type questions in examinations is often the choice for educators because it is thought to test the students' synthesis of knowledge and to test that deep learning has occurred (Race 2005).

Objective four of this study set out to explore if there was a relationship between participants preferred method of MI assessment and OSCE scores. Practical examinations scored third highest as a chosen method of examination. However, there was a slight change in opinion from Baseline to Time 1. Perhaps this resulted from the participants having been through the OSCE process, whereby, they may have found the

experience stressful, as identified by Brosnan et al. (2006) and Jay (2007). There was no relationship between preferred assessment method and OSCE scores.

When choosing an assessment method, there are a number of considerations that nurse educators might need to consider. One consideration could be the use of multiple intelligences to assess the students' multiple intellectual dispositions (Gardner 1983), similar to the research findings of Denny (2007). More specifically, assessment refers to measures of students' abilities and changes in knowledge, skills and attitudes during and after participation of a programme (Biggs 2003; Redfern et al. 2002; Bourke & Ihrke, 2005). Good practice includes multidimensional evaluation and identifying assessments that meet the varying learning styles and intellectual dispositions of students should lead to a productive assessment of student learning.

5.6 The findings related to Objective 5.

This objective sought to determine first year nursing students' experiences of the MITA approach to clinical skills teaching. Overall, the MITA approach to the learning and teaching of clinical skills was viewed very positively by participants in the experimental group. This study highlighted the need for a student-centred approach to learning as previously identified by Weber (2005) and Denny (2007).

5.6.1 Evaluation of a multiple intelligences teaching approach

Five key findings were found from the participants' feedback. The participants identified that MITA used a number of learning methods that helped them with their learning. The systematic structured approach used by MITA, which importantly incorporates reflection, helped increase participants' learning. MITA was considered to be interactive and contained a number of fun activities that helped with learning. Having personal contact with the educator in the skills laboratory was an important feature that was identified by the participants in this study.

A number of participants commented in their evaluation that MITA used diverse learning methods that helped them with their learning. This is consistent with Denny's (2007) findings, as all intellectual dispositions are facilitated when a MITA approach is used in the classroom. Specific reference was made in the evaluation to the use of picture boards developed especially for the module for the experimental group and made available at the end of each skills session through the college CMS. Participants in the experimental group scored higher for intrapersonal intelligence and relatively highly for spatial intelligence and they also scored high for sensing and visual learning style preferences and this could have influenced their satisfaction with the use of picture boards. A white board, for example, was used in the skills laboratory throughout the MITA sessions. Participants could express themselves and what they had learned, in either picture or word format, at the end of each skills session. Interestingly, after a number of weeks, a number of students started to take photographs of the whiteboard of the participants' drawings of what they had learned, following reflection time. This may have increased the participants' spatial intelligence as they connected the visual imagery on the white board with the learning of the clinical skills.

Reflection is the final phase in the MITA process. The study participants identified the use of reflection at the end of each skills session as playing an important role in helping them internalise the clinical skills learned. At the end of each skills session the participants had personal time (intrapersonal) for reflection followed by group reflection (interpersonal). This provided the participants with an opportunity to demonstrate what they had learned in the skills session and it was a further opportunity to ask any additional questions (Weber 2005). Reflection for MITA was used to encourage participants to adopt a deep approach to learning their clinical skills. This is consistent with previous findings identifying the use of reflection as a learning tool in nursing education (Löfmark & Wikblad 2001). A Swedish study (Löfmark & Wikblad 2001) with nursing students (n=47) explored factors that contributed to or inhibited learning in the clinical area. Reflective diaries were kept by the students in clinical placement. The findings indicated that reflective

discussions with clinical nursing staff and preceptors helped increase personal development and student responsibility.

As the module progressed and the participants developed a better understanding of the steps involved in the MITA approach, it was evident that they became increasingly interactive and their reflections became more critical. MITA has a strong student focus and it was noted that the participants engaged enthusiastically with all the activities during the clinical skills sessions. Having activities that are fun have been found to help increase student learning and this result is similar to other studies (Baid & Lambert 2010; Strean 2011). Baid and Lambert (2010) conducted a critical evaluation of the literature to explore the use of humour and '*fun*' teaching strategies within nursing education. They identified that the use of fun activities must be appropriate and relevant to the topic being taught. While Baid and Lambert (2010) recognised teaching as a very personal activity, they clearly acknowledged that the use of fun games in the classroom is only effective if the students accept this approach, as occurred in the current study. Similarly, Strean (2011) critically explored three methods of engaging students in the learning process that included music, humour and movement. Strean (2011) found that music enhanced student engagement, humour reduced anxiety and promoted a relaxed environment and movement increased energy levels and this is strongly supported in MITA and brain based learning.

Participants, in this study, commented in their evaluation, that having close contact with the lecturer was a positive finding. This is consistent with findings from Kelly et al. (2009) who conducted a multi-method evaluation study of an e-learning initiative with a group of first year nursing students (n=134) in Ireland. Part of the evaluation was to determine student satisfaction with the e-learning programme. Kelly et al. (2009) found that even though students were in favour of the use of technology they reported that it should be used in conjunction with the lecturer and not as a replacement. The students' main dissatisfaction with the use of the videos was their inability to ask a lecturer questions at times when they needed specific answers.

In contrast to the above findings, Jeffries et al. (2003) conducted an American study using an experimental design with nursing students (n=77) who were taught the skill of

a 12-lead ECG using a CD-ROM. Jeffries et al. (2003) reported that students did not require the support of a person, such as a nursing lecturer, in the skills laboratory. This result could be the result of cultural differences, confidence and different secondary school systems. It may also have been due to availability of adequate Internet facilities that was identified as insufficient in the study by Kelly et al. (2009).

In third level education students need to take ownership of their own learning and take this forward for their lifelong learning (Weber 2005). This research confirms that MITA is a learning and teaching approach that can help any learner, regardless of ability, to become actively involved in knowledge uptake and development in the classroom and clinical skills laboratory. Multiple Intelligences theory, using MITA, helps the educator create a learning environment that encourages learners of different abilities and learning preferences to learn and participate effectively in higher education (Weber 2005; Denny, 2007). According to Weber (2005, p.58)

> *"MITA lessons [encourage us] to reach back to students' past, to value present abilities, and to project toward future dreams".*

There is a change in the type of student entering third level education in relation to age, gender and ethnicity and, consequently, students present with many and varied learning needs and preferences, which MI and MITA can accommodate.

5.7 Implications of the study findings

In this section the strengths and limitations of the study, the use of MITA as well as the contributions of the study findings for theory and education in nursing, will be discussed.

5.7.1 Strengths and limitations of the study

A strength of this study is that it employed a RCT to explore the effect of teaching clinical skills using MITA (n=90) with first year undergraduate nursing students in one site. The RCT design permits a rigorous evaluation of the educational intervention (Lo-Binodo Wood & Haber 2010). The participants were randomly allocated to the

experimental and control groups by an independent person using a computer generated list to reduce selection bias (CONSORT Guidelines 2010). A clear description of the way in which participants were randomised to the experimental and control groups and the setting for the study was provided together with a description of the experimental and comparison interventions and the results for both the experimental and control groups reflecting the CONSORT Guidelines (2010).

The volunteers were recruited from first year nursing students enrolled on the nursing programme in September 2011 at the study site. This was logical as the study focused on teaching of clinical skills and the potential effect of MITA. All the study participants were undertaking a BSc (Hons) in Nursing and were considered representative of the local undergraduate nursing student population. It was important to recruit students who had not been exposed to clinical skills teaching previously and, hence, the reason for selecting first year students to minimize bias. There is a potential risk of selection bias when recruiting volunteers (LoBinodo-Wood & Haber 2010). Therefore, in an attempt to reduce this potential source of response bias, the study was explained to all first year nursing students by an academic colleague who was the programme leader. An information sheet was provided for all participants to read prior to agreeing to participate in the study (Appendix 9).

The sample size was considered small for this study (n=90), however, it represented the total 2011 intake for undergraduate nursing students in the study site. As there were no reported studies using MITA approach for the teaching of clinical skills, there was no literature with which to compare this sample size, therefore, this sample can be considered positively. However, it is acknowledged that the sample power calculation indicated the need for a sample of 765 which would have been required for a multi-site study and the potential bias of the confounders arising from educational site differences. The sample attrition rate was very low (n=3) and attrition took place before week three and before data collection. This study could be replicated in any school of nursing but it is suggested that more people would need to be trained in MITA as it is an intensive approach with substantial resource implications for its effective delivery.

Blinding of the participants to the researcher, the team involved for teaching skills to the control group, or the participants themselves, was not possible in this study because of the teaching intervention. However, in an attempt to reduce this source of bias, the researcher was not involved in the randomisation of participants to the experimental or control group, or in the OSCE assessment as recommended by the MRC (2000).

A further limitation of this study relates to the possible contamination between the participants in the experimental and the control groups. The researcher spoke personally to all participants in the experimental group prior to the commencement of the study and asked them not to share information with their peers in the control group in relation to the method of teaching.

The study researcher conducted all the MITA teaching to participants in the experimental group. This may have had an effect on the experimental group, known as the '*Halo effect'* or the participants knowing they were under observation, known as the '*Hawthorne effect'* (Cruise et al. 2006). In an attempt to overcome these threats, a discussion in relation to the study took place at the start of the study with the experimental group, and as much as possible a normal skills laboratory environment was maintained throughout the study.

The researcher was very interested and motivated with MITA as a method of teaching which may have affected the OSCE scores for the experimental group. Additionally, there may have been inconsistencies with the team of lecturers (n = 6) who taught the skills to the control group. A team meeting prior to the study emphasised the need to adhere to the learning outcomes for the module in order to minimise teaching variation.

Therefore, despite this study being a single site exploratory trial, every reasonable attempt was made to maintain research rigour with a full description of the research methods to permit the replication and further testing in another study site. However, it is acknowledged that a single site and the available small sample reflected the constraints within which the study was conducted and the necessary pragmatism of an unfunded doctoral study.

5.7.2 The teaching interventions

Two methods of teaching clinical skills were compared in this study, the use of MITA and the conventional approach of demonstration and supervision. Skills sheets for teaching were developed for all skills taught and these were agreed by the team prior to the commencement of the module. These skills sheets were developed and revised in the pilot study the previous year. DVDs were used from Clinical Skills Online website for the skills sessions. Both groups (experimental and control) had equal time in skills training sessions, which was an important consideration when examining the OSCE findings. The findings were more likely to represent the use of MITA rather than the results being caused by an extraneous variable (Denny 2007; Polit & Hungler 2010).

Participants from the control group were not permitted to join the experimental group to avoid contamination, for example, if they had missed a skills session due to illness. The researcher may have caused a potential positive effect on the experimental group, known as the '*Halo Effect'* (Thorndike 1920, cited in Marquis & Huston 2012). Additionally, students had access to the OSCE marking sheets two weeks in advance of their examination and this may have influenced the OSCE scores. A control group was used and it is expected that this would influence the scores for both groups. The researcher was not involved as an examiner for the OSCEs to prevent bias in the study outcome assessment.

5.7.2.1 Multiple intelligences teaching approach

All teaching with the experimental group was carried out by the researcher, who had a qualification in MITA, in an attempt to reduce inconsistencies and prevent a threat to internal validity. Teaching plans were devised for each skill and this was used to maintain consistency across all the student groups. If this study was to be replicated, this is one of the essential recommendations. Having small groups for clinical skills teaching sessions, no larger than six participants as in this study, is important if each participant is to be given equal opportunity to learn. It is noted, however, that due to

current economic conditions this small number of participants in a class may not be sustainable or achievable in all health education institutions.

5.7.2.2 Conventional teaching approach

The teaching of skills for the control group was carried out by a team of six lecturers. The team was informed, prior to the study, about the intended method of teaching for the experimental group using MITA. They were asked to continue teaching as normal, using demonstration and the use of DVDs. However, having this many people involved may have had an impact on the consistency of the delivery of the skills to the control group and, hence, a threat to internal validity. It is difficult to know if teaching styles or teaching preferences had an impact on how the skills for the control group were taught. It must be noted that this reflects the real world of teaching with different teaching styles of staff (Shuttleworth et al. 2008).

5.8 Contributions of the study

The purpose of this study was to test a method of teaching clinical skills while taking account of learning style preferences, MI preferences and MI assessment preferences. Identifying learning styles is important as they indicate how each individual receives and processes new information through their senses. Individual learning styles may be affected by culture and experience (Felder & Brent 2005). Therefore, this is separate from MI theory that describes how individuals solve problems using all of their intelligences (Gardner 1983). MI theory is considered a theory of cognitive functioning that describes how people solve problems (Gardner 1983). Gardner (1983) identified that everyone possesses eight intelligences, with some intelligences scoring higher than others but usually a balance is achieved. However, given the appropriate instructions, everyone has the capacity to develop their eight intelligences to a reasonably high level of performance. Having an awareness of Multiple Intelligences theory should encourage educators to develop many ways of teaching where the student can be actively engaged in the learning process. MI assessment considerations demonstrate reasons for choosing assessment types.

Identifying MI profiles and learning style preferences of students early in their third level education is important if the students are to understand how they learn best. It is not only essential to make students aware of how they learn, but they must also be encouraged to think about ways that they can enhance personal learning. Combining participants' learning styles and MI further raises awareness of metacognitive knowledge providing the learner with self-knowledge, self-reflection and self-responsibility (O' Connor & Brunton 2003). More specifically, Weber (2005) asserted that it is important to differentiate between "*how are you smart*?" and "*how smart are you?*"

5.9 Contribution of MITA in undergraduate nursing education

The MITA model is a five phase model that operationalises the theory of MI using a problem based learning approach (Weber 2000). It supports the idea that people have different strengths in intelligences and that they learn in many different ways (Gardner 1983; Weber 2005; Denny 2007). When educators are aware of participants' learning strengths a variety of teaching strategies can be developed to meet their needs. Educators should try to use a blend of teaching activities that meet the needs of diverse groups of learners (Gardner 1999; McKeachie 2002; Denny 2007). The quality of the educational experience can be improved for the students and the educators as a more holistic and student-centred approach is adopted with the use of MITA (Schaefer & Zygmont 2003).

Weber (2000) recommended the use of MITA to prevent passivity in higher education as topics can be explored to a greater level of understanding. As a result, MITA, has the potential to provide innovative approaches to learning and teaching in the third level setting. By working together with learners it is possible to develop multiple solutions to complex real world problems (Weber 2005).

Nursing could be accused of being rigid in its' approach to education by remaining attached to conventional methods of teaching and learning that fail to engage with the

individual learning needs of students (Fullan 2007; Dalley et al. 2008). Therefore, it is essential that the educational approaches adopted by nurse educators need to be reviewed in terms of the outcomes they achieve in the real world of nursing practice, rather than in the narrow confines of curricular activity (McKenna & Green 2004). The use of MITA as a method for the learning and teaching of clinical skills will require a change in attitude, not only from educators, but also from students. With the MITA approach the educator takes on the role of facilitator of learning (Weber 2005), as is the case in other teaching and learning strategies such as e learning. By adopting a student-centred approach to skills teaching educators may believe, however, they are not in control of their class time or the curriculum. This can be overcome by providing clear guidelines to the learners relevant to the curriculum (Weber 2005).

MITA encourages nurse educators to recognise that each student is an individual with a variety of intelligences that need to be drawn on (Weber 2005; Amerson 2006). Effectively this should help the student engage in active learning that in turn should motivate the student to adopt a deep approach to learning (Marton & Säljö 1984; Biggs 2001). This should reinforce clinical skills learning into the individual's professional development and more importantly into clinical practice (Weber 1999; Brunton & Jordan 2006; Denny et al. 2008). By encouraging the participants to take responsibility for their learning and getting them to move from being a passive recipient to an active recipient, then learning should be improved (Denny et al. 2008). Nonetheless, educators must also be aware that this may not be what participants want. The majority of participants in this study only had experience of a didactic approach to teaching and learning from secondary school where the emphasis was on rote learning and hence often surface learning (Hyland 2011).

It has been established that when curriculum content is taught to students in a way that encourages them to draw on their creative and analytical abilities then learning is improved and these students have been shown to outperform those students taught in the conventional manner (Grigorenko et al. 2002). The use of MITA in the skills laboratory, and indeed in other aspects of the curriculum, is one way of engaging all students. Despite the enthusiasm shown by the participants for this method of teaching

and the learning achievement, it is important to acknowledge that this structured approach to education is time consuming in relation to the groundwork required to prepare the MITA activities required for teaching. However, the benefits of using MITA out weigh its drawbacks because it espouses a student centred holistic teaching approach by using brain-based approaches to teaching and learning with consequent student active engagement in the learning process. The next chapter will discuss the conclusions and recommendations of the study.

Chapter 6 - Conclusion and recommendations

Introduction

Students enter pre-registration nursing programmes with a diversity of educational backgrounds, experiences, skill-sets, range of ages and cultural backgrounds. Accordingly, the learning needs and abilities of students are varied, as well as the teaching approaches used for successful engagement with the educational process. There is a concern that teaching and learning approaches in third level education adopt a "*one size fits all"* approach. However, when educators are aware of the students' learning style preferences and multiple intelligences preferences, they can assist the student to achieve their maximum potential.

The learning and teaching of clinical skills for nursing students is an important element in nursing education curriculum. The use of clinical skills laboratories for simulated learning has gained increasing recognition in recent years. However, the most appropriate method for teaching clinical skills is contentious. Didactic teaching approaches have traditionally been used for clinical skills teaching. However, this teacher-led only approach limits student engagement and interactivity, which in turn can potentially have a negative impact on learning, because it does not support individual learning needs. Educators are responsible for providing a positive learning environment that is student-focused and that allows the student the opportunities to engage appropriately with educational material in a deep and meaningful way.

This aim of this study was to test the effectiveness of MITA as a method of teaching clinical skills to first year undergraduate nursing students. The use of MITA, as a method of teaching clinical skills is supported in this study. It is suggested that when teaching approaches meet the students' individual strengths and abilities, they can achieve greater personal and academic success (Weber 2005).

6.1 Contribution for professional practice

The findings of this study extend the worldwide evidence-base in relation to MITA and the teaching and learning of clinical skills in nursing. Educators need to continually investigate and reflect on evidence-based teaching and learning approaches, especially skills laboratory teaching, by measuring educational interventions empirically. Reflecting on the students' complex learning needs by assessing learning style preferences and multiple abilities is further recommended. The significance of this study is the potential benefit of MITA in achieving effective student-centred and individualised education for the learning and teaching of clinical skills.

This study has contributed to the knowledge of clinical skills teaching and learning in Ireland, as the majority of the research in this area has been originally carried out in Australia, United Kingdom and United States of America.

6.2 Implications for practice

This study has relevance and implications for nurse educators who have a responsibility to develop their teaching and learning approaches, in particular clinical skills teaching. This study will be of particular interest to educators who work with curricula that prepare nursing students with the knowledge, skills and attitude necessary for the complex world of clinical practice. MITA, as a method of teaching and learning, offers an innovative approach for teaching clinical skills. Students can benefit from the use of MITA because it is a systematic approach to teaching that can create a positive and motivating environment for learning because it has such a strong student focus. The method of teaching clinical skills should reflect an evidence based education to ensure effective learning. Reflection at the end of the skills session should continue to be promoted because it encourages the student to critically evaluate their clinical skills performance and learning and reinforces their personal learning. Student evaluation of teaching and learning approaches, such as MITA, will enable educators to appraise/modify or adapt new approaches to facilitate clinical skills teaching.

MI assessment preferences can be explored with the use of an appropriate questionnaire. However, students should be given a range of assessments that match their personal assessment choices and their differing intellectual dispositions.

6.3 Recommendations for research

Further research is needed to evaluate the effectiveness of MITA for skills teaching in the long term so as to evaluate its efficacy, effectiveness and utility in relation to improved skills retention. Further research is also needed to investigate how MITA impacts on learners from disparate disciplines, for example, engineering, pilot training and architecture, whose curricula incorporate psychomotor skills teaching.

The following recommendations are made:

1. More research is required on the use of MITA for clinical skills teaching, in third level education, if the robustness and sustainability of its effects are to be further tested.
2. There is scope for further study to explore whether MITA if conducted at other sites, with first year nursing students, would produce similar results.
3. Future studies could explore if MITA could be used by nurses who precept student nurses in the clinical area.
4. Research could be carried out to identify MI and learning styles preferences of first year students across different faculty entering third level education.

Conclusion

In summary, this study contributes to nursing knowledge by enhancing the understanding of a MI teaching approach for clinical skills education. The findings of this study provide insight into the effectiveness of MITA as a teaching method for clinical skills for undergraduate nursing students. As no studies were found using MITA for clinical skills learning and teaching, this study has contributed to nursing knowledge in Ireland and abroad. Educators should continue to use a wide lens to focus

on the students' individual strengths and multiple abilities to encourage learning. This study explored the use of MITA and provides a strong basis for further investigation in the field of nursing education.

References

Ackermann A.D. (2009) Investigation of learning outcomes for the acquisition and retention of CPR knowledge and skills learned with the use of high-fidelity simulation. *Clinical Simulation in Nursing* (2), e213-e222.

Aggarwal R., Grantcharov T.P. & Darzi A. (2007) Framework for systematic training and assessment of technical skills. *Journal of American College of Surgeons* 204 (4), 697-705.

Akkuzu N. & Akcay H. (2011) The design of a learning environment based on the theory of multiple intelligence and the study its effectiveness on the achievements, attitudes and retention of students. *Procedia Computer Science* 3 (5), 1003–1008.

Alfonseca E., Carro R.M., Martín E., Ortigosa A. & Paredes P. (2006) The impact of learning styles on student grouping for collaborative learning: a case study. *User Model User-Ad* 16 (3), 377-401.

Alkhasawneh I.M., Mrayyan M.T., Docherty C., Alashram S. & Yousef H.Y. (2008) Problem-based learning (PBL): assessing students' learning preferences using VARK. *Nurse Education Today* 28 (4), 572–579.

Alinier G. (2003) Nursing students' and lecturers' perspectives of objective structured clinical examination incorporating simulation. *Nurse Education Today* 23 (2), 419–426.

Alinier G., Hunt B., Gordon R. & Harwood C. (2006) Effectiveness of intermediate-fidelity simulation in undergraduate nursing education. *Journal of Advanced Nursing* 53(3), 359-369.

American Heart Association (2010) *American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.* AHA, New York.

Amerson R. (2006). Energising the nursing lecture: Application of the theory of multiple intelligence learning. *Nurse Education Perspective 27*(4), 194 – 196.

Amin T.T., Kaliyadan F. & Al-Muhaidib N.S. (2011) Medical students' assessment preferences at King Faisal University, Saudi Arabia. *Advances in Medical Education and Practice* 2 (1), 95-103.

An Bord Altranais (2000) *Review of Scope of Practice for Nursing and Midwifery: Final Report.* An Bord Altranais, Dublin.

An Bord Altranais (2005) *Requirements and Standards for Nurse Registration Education Programmes.* 3rd ed. An Bord Altranais, Dublin.

An Bord Altranais (2011) *Register Statistics 2011.* An Bord Altranais, Dublin.

Anderson L.W., Krathwohl D.R., Airasian P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R.,Raths, J. & Wittrock, M.C. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (Complete edition). Longman, New York.

Anderson M. & Stickley T. (2002) Finding reality: the use of objective structured clinical examination (OSCE) in the assessment of mental health nursing students interpersonal skills. *Nurse Education in Practice* 2 (2), 160-168.

Andrews G.J., Brodie D.A., Andrews J.P., Hillan E., Thomas B.G., Wong, J. & Rixon L. (2006) Professional roles and communications in clinical placements: A qualitative study of nursing students' perceptions and some models for practice. *International Journal of Nursing Studies* 43 (7), 861–874.

Arguel A. & Jamat E. (2009) Using video and static pictures to improve learning of procedural contents. *Computers in Human Behavior* 25 (2), 354–359.

Armstrong T. (2009) *Multiple Intelligences in the Classroom.* 3rd Ed. ASCD, Alexandria.

Astin F., Closs J.S. & Hughes N. (2006) The self-reported learning style preferences of female Macmillan clinical nurse specialist. *Nurse Education Today* 26 (6), 475–483.

Bachman K. (1990) Using mental imagery to practice a specific psychomotor skill. *Journal of Continuing Education in Nursing* 21 (3), 125-128.

Baeten M., Kyndt E., Struyven K. & Dochy F. (2010) Using student-centred learning environments to stimulate deep approaches to learning: Factors encouraging or discouraging their effectiveness. *Nurse Education Today* 5(3), 243-260.

Baid H. & Lambert N. (2010) Enjoyable learning: The role of humour, games, and fun activities in nursing and midwifery education. *Nurse Education Today* 30(6), 548-552.

Ballie L. & Curzio J. (2008) Students' and facilitators' perceptions of simulation in practice learning. *Nurse Education Today* 9(5), 297-306.

Banning M. (2005) Approaches to teaching: Current opinions and related research. *Nurse Education Today* 25 (7), 502-508.

Barman A. (2005) Critiques on the objective structured clinical examination. *Annals Academy of Medicine* 34 (4), 478-472.

Barr R.B. & Tagg J. (1995) From teaching to learning. *Change* 27(6), 13-25.

Barry M., Noonan M., Bradshaw C. & Murphy-Tighe S. (2012) An exploration of student midwives' experiences of the Objective Structured Clinical Examination assessment process. *Nurse Education Today* 32 (5), 690-694.

Bartfay W., Rombough R., Howse E. & Leblanc R. (2003) The OSCE approach in nursing education. *Canadian Nurse* 100 (3), 18-23.

Bastable S.B. (2008) *Nurse as Educator: Principles of Learning and Teaching for Nursing Practice.* 3rd ed. Jones and Bartlett Publishers, Sudbury.

Baum S., Viens J. & Slatin B. (2005) *Multiple Intelligences in the Elementary Classroom: Pathways to Thoughtful practice.* Teachers College Press, New York.

Beattie M. (2006) *The Art of Learning to Teach: Creating Professional Narratives*. Pearson Education, New Jersey.

Beghetto R. A. (2007). Does creativity have a place in classroom discussion? Prospective teachers' response preferences. *Thinking Skills and Creativity* 2 (1), 1-9.

Behan J. Condon N. Milic'evic I. & Shally C. (2009) *A Quantitative Tool for Workforce Planning in Healthcare: Example Simulations Report by the Skills and Labour Market Research Unit, FÁS Expert Group on Future Skills Needs Skills and Labour Market Research Unit (SLMRU).* Planning and Research Department, Dublin.

Beller M. & Gafni, N. (2000) Can item format (multiple choice vs. open-ended) account for gender differences in mathematics achievement? *A Journal of Research* 42 (1), 1–21.

Bengtsson M. & Ohlsson B. (2010) The nursing and medical students motivation to attain knowledge. *Nurse Education Today* 30 (1), 150-156.

Benner P. (1982) From Novice to Expert. *American Journal of Nursing* 82 (30), 402-407.

Benner P. (1984) *From Novice to Expert: Excellence in Clinical Nursing Practice.* Addison Wesley, New York.

Benner P., Sutphen M. Leonard V. & Day L. (2010) *Educating Nurses: A Call for Radical Transformation.* Jossey-Bass, San Francisco.

Bentley T. (2000) Learning beyond the classroom. *Educational Management & Administration* 28(3), 353-364.

Berkowet S., Virkstis K., Stewart J., & Conway L. (2009) Assessing new graduate nurse performance. *Nurse Educator* 34(1),17-22.

Biggs J., Kember D., & Leung Y. (2001). The revised two-factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology* 71 (1), 133–149.

Biggs J. (2003) *Teaching for Quality Learning at University*. The Society for Research into Higher Education and Open University Press, Buckingham.

Billings D.M. & Halstead J.A. (2005) *Teaching in Nursing: A Guide for Faculty.* Elsevier Saunders, Missouri.

Bjørk I.T. (1997) Changing conceptions of practical skill and skill acquisition in nurse education. *Nursing Inquiry* 4 (2), 184-195.

Bjørk I.T & Kirkevold M. (1999) Issues in nurses' practical skill development in the clinical setting. *Journal of Nursing Care Quality* 14 (1), 72-84.

Bland J. & Altman D. (1997) Statistics notes: Cronbach's alpha. *British Medical Journal* 314 (7080), 572.

Bloomfield J.G., While A.E. & Roberts J.D. (2008) Using computer-assisted learning for clinical skills education in nursing: an integrative review of the literature. *Journal of Advanced Nursing* 63 (3), 222–235.

Bloomfield J.G., Roberts J. & While A. (2010) The effect of computer-assisted learning versus conventional teaching methods on the acquisition and retention of hand washing theory and skills in pre-qualification nursing students: a randomised controlled trial. *International Journal of Nursing Studies* 47 (2), 287–294.

Bloomfield J.G., Cornish J.C., Parry A.M., Pegram A. & Moore J.S. (2013) Clinical skills education for graduate-entry nursing students: Enhancing learning using a multimodal approach. *Nurse Education Today* 33 (2), 247-252.

Bond W.F., Lammers R.L. & Spillane L.L. (2007) The use of simulation in emergency medicine: a research agenda. *Acad Emerg Med* 14 (4), 353-364.

Bordens K. & Abbott B. (2007) *Research Design and Methods: A Process Approach.* McGrath Hill, London.

Borneuf A.M. & Haigh C. (2010) The who and where of clinical sills teaching: A review from the UK perspective. *Nurse Education Today* 30 (2), 197-201.

Botti M. & Reeve R. (2008) Role of knowledge and ability in student nurses' clinical decision making. *Nursing and Health Sciences* 5 (1), 39-49.

Boud D., Keogh R., & Walker D. (1985). What is reflection in learning?. In Boud D., Keogh R. & Walker D. (eds.) *Reflection: Turning Experience into Learning* (pp. 85–90). Nichols Publishing Company, New York.

Bourke M.P. & Ihrke B.A. (2005) The evaluation process, an overview. (Eds) *Teaching in Nursing* (Billings D.M. & Halstead J.A. eds. Pp.443-465) 2nd Ed. Elsevier Saunders, St. Louis.

Boyd E.M. & Fales A.W. (1983) Reflective learning: Key to Learning from experience. *Journal of Humanistic Psychology* 23(99), 99-117.

Bradley P. (2002) Introducing clinical skills training in the undergraduate medical curriculum. *Medical Teacher* 24 (2), 209-212.

Bradshaw A. & Merriman C. (2008) Nursing competence 10 years on: fir for practice and purpose yet? *Journal of Clinical Nursing* 17(10), 1263-1269.

Briggs A. (1972) *Report of the Committee on Nursing.* HMSO, London.

Brookfield S.D. (1995) *Understanding and Facilitating Adult Learning.* Open University Press, Milton Keynes.

Broomfield R. (1996) A quasi-experimental research to investigate the retention of basic cardiopulmonary resuscitation skills and knowledge by qualified nurses following a course in professional development. *Journal of Advanced Nursing* 23 (6), 1016-1023.

Brosnan M., Evans W., Brosnan E. & Brown G. (2006) Implementing objective structured clinical skills evaluation (OSCE) in nurse registration programmes in a centre in Ireland: A utilisation focused evaluation. *Nurse Education Today* 26 (1), 115-122.

Brown L.P. (2011) Revisiting our roots: caring in nursing curriculum design. *Nurse Education in Practice* 11 (6), 360e-364e.

Brunton E. & Jordan A. (2006) Learning Strategies, Metacognition and College Success. *In The Challenges of Diversity: Teaching, Support and Student Learning Proceedings of the 4th Annual Conference*, Galway.

Bryan C. & Clegg K. (eds) (2006) *Innovative Assessment in Higher Education.* Routledge, Oxon.

Burns N. & Grove S. (2005) *The Practice of Nursing Research: Conduct, Critique and Utilization.* 5th Ed. Saunders Elsevier, Missouri.

Buros O. (1999) *The Thirteenth Mental Measurements Year Book: Supplement*. Gyphon Press, New Jersey.

Butterworth T., Bell L., Jackson C. & Pajnkihar M.(2008) Wicked spell or magic bullet? A review of the clinical supervision literature 2001–2007. *Nurse Education Today* 28 (2), 264–272.

Byrne E. & Smyth S. (2007) Lecturers' experiences and perspectives of using an objective structured clinical examination. *Nurse Education in Practice* 8 (3), 283-289.

Caldwell K.; Coleman K.; Copp G.; Bell L. & Ghazi F. (2007) Preparing for professional practice: How well does professional training equip health and social care practitioners to engage in evidence-based practice? *Nurse Education Today* 27 (6), 518-528.

Casey K., Fink R., Krugman M., & Propst J. (2004) The graduate nurse experience. *Journal of Nursing Administration* 34 (6),303-311.

Cavanagh S., Hogan K. & Ramgopal T. (1995) The assessment of student nurse learning styles using the Kolb Learning Styles Inventory. *Nurse Education Today* 15 (3), 177–183.

Central Applications Office Ireland (CAO) (2012) *Points required for entry to 2012 level 8 courses*. Retrieved from http://www2.cao.ie/points/LVL8_12_mju.htm on 25 September 2012.

Chamorro-Premuric T., Furnham A. & Lewis M. (2007) Personality and approaches to learning predict preference for different teaching methods. *Learning and Individual Differences* 4 (2), 241-250.

Chapelhow C., Crouch S., Fisher M. & Walsh A. (2005) *Uncovering Skills for Practice.* Nelson Thornes Ltd., Cheltenham.

Chambers Clark C. (2008) *Classroom Skills for Nurse Educators.* Jones and Bartlett Publishers, Boston.

Chang A., Chou C.L, Teherani A. & Haueri K.E. (2011) Clinical skills-related learning goals of senior medical students after performance feedback. *Medical Education* 45(9), 878-885.

Chen J.Q. (2004) Theory of multiple intelligences: Is it a scientific theory? *Educators College Record* 106, 17-23. Retrieved from http://www.tcrecord.org/ on 22 November 2012.

Childs J. C. & Sepples S. (2006) Clinical teaching by simulation: Lessons learned from a complex patient care scenario. *Nursing Education Perspectives* 27 (3), 154-158.

Clapper T.C. & Kardong-Edgrong S. (2012) Using deliberate practice and simulation to improve nursing skills. *Clinical Simulation in Nursing* 8 (1), e109-e113.

Clark M. (2005) Applying multiple intelligences to clinical simulation. *Clinical Simulation in Nursing Education* 3 (1), e37- e39.

Clynes M.P. & Rafferty S.E.C. (2008) Feedback: an essential element of student learning in clinical practice. *Nurse Education in Practice* 8 (6), 405-411.

Coakes, S.J., Steed L. & Dzidic, P. (2006) SPSS *Version 13.0 for Windows: Analysis Without Anguish*. John Wiley and Sons, Sydney.

Coffield F., Moseley D. Hall E. & Ecclestone K. (2004) *Learning Styles and Pedagogy in Post-16 Learning. A Systematic and Critical Review.* Cromwell Press Ltd., Wiltshire.
Cohen L., Manion L. & Morrison K. (2007) *Research Methods in Education.* Routledge, New York.

Cole M. (2009) Exploring the hand hygiene competence of student nurses: A case of flawed self-assessment. *Nurse Education Today* 29 (4), 380-388.

Committee on Nursing (1972) *Report of the Committee of Nursing. (Briggs Report)* HMSO, London (Cmnd 5115).

Conn J. (2002) What can clinical teachers learn from Harry Potter and the Philosopher's Stone. *Medical Education* 36 (12), 1176–1181.

CONSORT Guidelines (2010) *The CONSORT Statement.* Retrieved from http://www.consort-statement.org/consort-statement on 10 September 2012.

Corbally M.A. (2005) Considering video production? Lessons learned from the production of a blood pressure measurement video. *Nurse Education in Practice* 5 (6), 375–379.

Corbin J. & Strauss A. (2008) *Basics of Qualitative Research.* Sage, London.

Corlett, J., Palfreyman, J.W., Staines, H.J. & Marr, H. (2003) Factors influencing theoretical knowledge and practical skill acquisition in student nurses. An empirical experiment. *Nurse Education Today* 23 (3), 183–190.

Craddock E. (1993) Developing the facilitator role in the clinical area. *Journal of Nursing Education* 13 (2), 217-224.

Dall'Alba G. & Sandberg J. (2006) Unveiling professional development: A critical review of stage models. *Review of Educational Research* 76 (3), 383-412.

Dalley K. Candela L. & Benzel-Lindley J. (2008) Learning to let go: the challenge of de-crowding the curriculum. *Nurse Education Today* 28 (1), 62–69.

Data Protection Act (2003) *Data Protection (Amendment) Act.* Stationery Office, Dublin.

Davids K., Button C. & Bennett S. (2005) *Dynamics of Skill Acquisition.* Human Kinetics, Champaign.

DeBourgh G.A. (2011) Psychomotor skills acquisition for novice learners: A case for contextual learners. *Nurse Education* 36(4), 144-149.

DeVita M.A. (2007) Simulation and the prognosis for the apprenticeship model of health care education. *Journal of Intensive Care Medicine* 22(5),310-311.

De Young S. (2003) *Teaching Strategies for Nurse Educators.* Prentice Hall, New Jersey.

Demos (2005) *About Learning: Report of the Learning Working Group* London; Demos. Retrieved from http://www.demos.co.uk/publications/aboutlearning on 9th September 2011.

Denny M. (2007) Exploring how Teaching for Multiple Intelligence Affects Student Achievement in an Undergraduate Nursing Education Programme in Ireland. PhD Thesis, University College Cork.

Denny M., Redmond Stokes O., Wells J., Weber E., McMaster R., Taylor M. & O' Sullivan K. (2008) 'The learning experience: A new approach to optimise student learning.' In *Nursing Education Challenges in the 21st Century* (Callara L.ed.) pp 23-48. Nova Science Publishers Inc., New York.

Denny M., Weber E.F., Wells J., Redmond Stokes O. & Lane P. (2008) Matching purpose with practice: revolutionising nursing education with MITA. *Nurse Education Today* 28(1), 100-107.

Denny M. (2010) Teaching for multiple intelligence in undergraduate education. In *Tech-Education* (Lytras et al. eds) pp 680-691. Springer Verlag, Berlin.

Denny M. & Wells J.S. (2010) Smart educators use smart intelligence. *In 1st International Scientific Conference; Building Capacity and Capability in Nursing.* The Nurses & Midwives Society of Maribor. pp. 97-105.

Dewey J. (1933) *How we Think. A Restatement of the Relation of Reflective Thinking to the Educative Process* (Revised ed.) D. C. Heath, Boston.

Di'az-Lefebvre R. (1999) *Colouring Outside the Lines: Applying Multiple Intelligences and Creativity in Learning.* John Wiley and Sons, New York.

Diener E. & Crandall R. (1978) *Ethics in Social and Behavioural Research.* University of Chicago Press, Chicago.

Dosseville F., Laborde S.& Soelles N. (2012) Music during lectures: Will students learn better? *Learning and Individual Differences,* 22, 258-262.

Dowie I. & Phillips C. (2011) Supporting the lecturer to deliver high-fidelity simulation. *Nursing Standard* 25(49), 35-40.

Driscoll J. (2000) *Practising Clinical Supervision.* Balliére Tindall, Edinburgh.

Dunn R. & Griggs, S.A. (1995) *Multi-culturalism and Learning Style.* CT: Praeger, Westport.

Ehrenberg A.C. & Häggblom M. (2007) Problem-based learning in clinical nursing education: Integrating theory and practice. *Nurse Education in Practice* 7 (1), 67-74.

Eldarir S.A., El Sebaae H.A., El Feky H.A., Hussien H.A., El Fadil N.A & El Shaeer H.E. (2010) An introduction of OSCE versus traditional method in nursing education: faculty capacity building and students' perspectives. *Journal of American Science* 6 (12), 1002-1014.

Emerson R.J. (2007) *Nursing Education in the Clinical Setting.* Elsevier, Missouri.

Ericsson K.A. (2004) Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Acad Med* 79 [Suppl 10]:S70–S81.

Ericsson K.A. (2008) Deliberate practice and acquisition of expert performance: A general overview. *Academic Emergency Medicine* 15 (8), 988-994.

European Association for Quality Assurance in Higher Education (2005) *Standards and Guidelines for Quality Assurance in the European Higher Education Area.* Retrieved from http://www.bolognabergen2005 no/Docs/00-Main_doc/050221_ENQA_report.pdf. on 22nd October 2011.

Ewashen C. & Lane A. (2007) Pedagogy, power and practice ethics: clinical teaching in psychiatric/mental health settings. *Nursing Inquiry* 14 (3), 255–262.

Farley A. & Hendry C. (1997) Teaching practical skills: a guide to preceptors. *Nursing Standard* 11(29), 46-48.

Farrow D. Baker J. & MacMahon C. (2008) *Developing Sport Expertise.* Routledge, Oxon.

Felder R.M. & Silverman L.K. (1988) learning and teaching styles in engineering education. *Engineering Education* 78 (7), 674-681.

Felder R.M. & Solomon B.A. (1998) *Index of Learning Styles.* Retrieved from www.ncsu.eduleffective_teaching/ILSpage.html on 9th September 2011.

Felder R.M. & Brent R. (2005) Understanding student differences. *Journal of Engineering Education* 94 (1), 57-72.

Felder R.M. & Spurlin J. (2005) Applications, reliability and validity of the Index of Learning Styles. *International Journal of Engineering Education* 21 (1), 102-115.

Fell C. (2000) Hand washing: simple, cost effective, evidence based …lip service! *British Journal of Perioperative Nursing* 10 (4), 461-465.

Felicia P. & Pitt I. (2009) *Profiling Users in Educational Games.* In Games-based Learning Advancement for Multisensory Human Computer Interfaces: Techniques and Effective Practices (Connolly, T.M., Stansfield, M.H. and Boyle, E., Eds). Idea-Group Publishing, Hershey.

Ferguson L.M. & Day R.A. (2007). Challenges for new nurses in evidence-based practice. *Journal of Nursing Management* 15 (1), 107 – 113.

Fisher R.A. (1971) *The Design of Experiments.* 8th Ed. Oxford University Press, Oxford.

Fisher A. & Kielhofner G. (2005) Skill in occupational performance. In *A model of Human Occupation, Theory and Application* (Kielhofner G. ed) pp. 113–137.

Fitts P.M. & Posner M.I. (1967) *Human Performance.* Brooks/Cale, Belmont.

Fleming N.D. (2008) VARK. A Guide to Learning Styles. The VARK Questionnaire. Retrieved from http://www.vark-learn.com/english/page.asp?p=questionnaire on 16th January 2012.

Fonteyn M.E. & Cahill C. (1998) The use of clinical logs to improve nursing students' metacognition: a pilot study. *Journal of Advanced Nursing* 28 (1), 149-154.

Fraser K., Peets A., Walker I., Tworek J., Paget M., Wright B. & McLaughlin K. (2009) The effect of simulator training on clinical skills acquisition, retention and transfer. *Medical Education* 43 (7), 784–789.

Freshwater D. & Johns C. (2005) *Transforming Nursing through Reflective Practice.* 2nd ed. Blackwell, Oxford.

Freeman R. & Lewis R. (2002) *Planning and Implementing Assessment.* Kogan Page Limited, London.

Freeth D. & Fry H. (2005) Nursing students' and tutors' perceptions of learning and teaching in a clinical skills centre. *Nurse Education Today* 25 (4), 272-282.

Freshwater D. (2002) *Therapeutic Nursing: Improving Patient Care through Self-Awareness and Reflection.* Sage Publications, London.

Fry H., Ketteridge S. & Marshall S. (2009). *A Handbook for Teaching and Learning in Higher Education: Enhancing AcademicPpractice.* 3rd ed. Routledge, Abingdon.

Fullan M. (2007) *The New Meaning of Educational Change*. 4th ed. Teachers College Press, New York.

Funnell R., Koutoukidis G. & Lawrence K. (eds) (2008) *Tabbner's Nursing Care: Theory and Practice.* Elsevier, Chatswood Sydney.

Furnham A. & Chamorro-Premuzic T. (2005) Individual differences and belief concerning preference for university assessment methods. *Journal of Applied Social Psychology* 35 (9), 1968–1994.

Furnham A., Christopher A., Garwood J. & Martin N.G. (2008) Ability, demography, learning style, and personality trait correlates of student preference for assessment method. *Educational Psychology* 28 (1), 15-27.

Gaba D.M. (2007) The future of simulation in healthcare. *Simulation in Healthcare* 2 (2), 126-136.

Gaberson K.B. & Oermann M.H. (2007) *Clinical Teaching Strategies in Nursing*. 2nd ed. Springer Publishing Company, New York.

Gagne R.M. (1985) *The Conditioning of Learning and Theory of Instruction*- 4th ed. Holt-Saunders International Editions, New York.

Galbraith M.W. (1991) *Facilitating Adult Learning.* Krieger Publishing, Malabar.

Gardner H. (1983) *Frames of Mind.* Basic Book Inc., New York.

Gardner H. (1991) *The Unschooled Mind: How Children Think and How Schools should Teach.* Basic Books Inc, New York.

Gardner H. (1993) *Frames of mind: The Theory of Multiple Intelligences*. (10th Anniversary Ed.) Basic Books, New York.

Gardner H. (1999) *Intelligence Reframed. Multiple Intelligence for the 21st Century.* Basic Books, New York.

Gardner H. (2004). Audiences for the theory of multiple intelligences. *Teachers College Record* 106 (1), 212 – 220.

Gardner H. (2006) *Multiple Intelligences: New Horizons.* Basic Books, New York.

Gardner E.A., Deloney L.A. & Grando V.T. (2007) Nursing student descriptions that suggest changes for the classroom and reveal improvements needed in study skills and self-care. *Journal of Professional Nursing* 23 (2), 98-104.

Gentile A.M. (1972) A working model of skill acquisition with application to teaching. *Quest,* Monograph XVII, 3-23.

Gibbs G. (2010) *Using Assessment to Support Student Learning.* Leeds Metropolitan Press, Leeds.

Glaister K. (2007) The presence of mathematics and computer anxiety in nursing students and their effects on medication dosage calculations. *Nurse Education Today* 27 (4), 341-347.

Goldfinch J. & Hughes M. (2007) Skills, learning styles and success of first year undergraduate students. *Active Learning in Higher Education* 8 (3), 259-273.

Gomez G.E. & Gomez A.E. (1984) The teaching of psychomotor skills in nursing. *Nurse Educator* Winter, 35-39.

Gomez G.E. & Gomez A.E. (1987) Learning of psychomotor skills: laboratory versus patient care setting. *Journal of Nursing Education* 1 (1), 20-24.

Gonzalez J & Wagnaar R. (Eds) (2008) *Universities' contribution to the Bologna Process.* (2nd ed) Retrieved from http://www.tuning.unideusto.org/tuningeu/index.php on 10th January 2012.

Gouws F.E. (2007) Teaching and learning through multiple intelligences in the outcomes-based education classroom. *Africa Education Review* 4 (2), 60-74. Retrieved from http://www.informaworld.com/ on 22nd October 2012.

Graf S., Viola S.R. & Leo T. (2007) In-depth analysis of the Felder-Silverman learning styles dimensions. *Journal of Research on Technology in Education* 40 (1), 1-15.

Grant J.S., Moss J., Epps C. & Watts P. (2009) Using video-facilitated feedback to improve student performance following high-fidelity simulation. *Clinical Simulation in Nursing* 12, e1-e8.

Greaney V. & Kellaghan T. (1996) *Monitoring Learning Outcomes of Education Systems.* The World Bank, Washington.

Green H., Facer K. & Rudd T. (2006) Personalisation and digital technologies, Nesta Future Laboratory. Retrieved from http://futurelab.org.uk/resources/publications_reports-articles/opening-education-reports on 10th September 2012.

Grigorenko E.L., Jarvin L. & Sternberg R.J. (2002) School-based tests of the triarchic theory of intelligence: Three settings, three samples, three syllabi. *Contemporary Educational Psychology* 27 (3), 167-208.

Gunberg Ross J. (2011) Simulation and psychomotor skill acquisition: A review of the literature. *Clinical Simulation in Nursing*, In Press corrected proof, doi:10.1016/j.ecns.2011.04.004.

Gustafsson C. & Fagerberg I. (2003) Reflection, the way to professional development? *Journal of Clinical Nursing* 13 (3), 271-280.

Gutgsell K.J., Schluchter M., Margevicius S., DeGolia PA., McLaughlin B., Harris M., Mecklenburg J. & Wiencel C. (2012) Music therapy reduces pain in palliative care patients: A randomized controlled trial. *Journal of Pain and Symptom Management*, In Press, Corrected Proof, http://dx.doi.org/10.1016/j.jpainsymman.2012.05.008.

Haley, M.H. (2004). Learner-centred instruction and the theory of multiple intelligences with second language learners. *Teachers College Record* 106 (2), 163 – 180.

Hall W.A. (2006) Developing clinical placements in times of scarcity. *Nurse Education Today* 26 (7), 627-633.

Harden R.M., Stevenson M., Downie W.W. & Wilson G.M. (1975). Assessment of clinical competence using objective structured examination. *British Medical Journal* 1 (4), 447-451.

Harden R.M. & Gleeson F. (1979) Assessment of clinical competence using an objective structured clinical examination (O.S.C.E.). *Medicine Education* 31(1) , 41-54.

Harden V. & Harden R.M. (2003) Guide to the OSCE no 17 *BEME* Retrieved from http://www2.warwick.ac.uk/fac/med/beme/ on 22 September 2013.

Hargreaves D.J. (1997) Student learning and assessment are inextricably linked. *European Journal of Engineering Education* 22(4), 401-409. Retrieved from http://www.informaworld.com/smpp/title~content=t713415498 on2nd November 2011.

Hass J. & Larson E. (2007) Measurement of compliance with hand hygiene. *Journal of Hospital Infection* 66 (1), 6–14.

Hatelevik I.K.R. (2011) The theory-practice relationship: reflective skills and theoretical knowledge as key factors in bridging the gap between theory and practice in initial nursing education. *Journal of Advanced Nursing* 68 (4), 868-877.

Hawk T.F. & Shah A.J. (2007) Using learning style instruments to enhance student learning. *Decision Sciences Journal of Innovative Education* 5 (1), 1-19.

Health Service Executive (2009) *Findings from a Survey of 2007 Nursing Graduates, Where are They Now?* HSE, Dublin.

Heppner P.P., Kivlighan D.M. & Wampold B.E. (2004) *Research Design in Counseling.* 2nd Ed. Brooks/Cole Publishing Company, California.

Hickey M.T. (2009) Preceptor perceptions of new graduate nurse readiness for practice. *Journal Nurses Staff Development* 25(1), 35-41.

Higgins A., Begley C., Timmons F., McGonagle I. & Nevin M. (2010) *Nurse and Midwife Clinical Competency Determination and Competency Development Planning Toolkit.* National Council for the Professional Development of Nursing and Midwifery, Dublin.

Higher Education and Training Award Councils (HETAC) (2009) *Assessment and Standards.* Higher Education and Training Awards Council, Dublin.

Hilton P.A. & Pollard C.L. (2005) Enhancing the effectiveness of learning and teaching of core clinical skills. *Nurse Education in Practice* 5(5), 289-295.

Hogg G., Pirie E.& Ker, J. (2006) The use of simulated learning to promote safe blood transfusion practice. *Nurse Education in Practice* 6 (3), 214–223.

Honey P. & Mumford A. (2000) *The Learning Styles Questionnaire 80-item Version.* Peter Honey Publications Limited, Berks.

Hope A. (2003) Clinical governance and the role of the lecturer / practitioner in education in one British National Health Service (NHS) Trust. *Journal of Nursing Management* 11(3), 164-167.

Hope A., Garsdie J. & Prescott S. (2011) Re-thinking theory and practice: Pre-registration student nurses experiences of simulation teaching and learning in the acquisition of clinical skills in preparation for practice. *Nurse Education Today* 31 (7), 711-715.

Houghton C.E., Casey D., Shaw D. & Murphy K. (2012) Staff and students' perceptions and experiences of teaching and assessment in Clinical Skills Laboratories: Interview findings from a multiple case study. *Nurse Education Today* 32 (6), e29-e34.

Howitt D. & Cramer P. (2000) *First Steps in Research and Statistics*. Routledge, London.

Hsueh W.C. (2003) The development of an MI Assessment for young children in Taiwan. *In Paper presented at the annual meeting of the American Education Research Association,* Chicago.

Huber M.T. & Hutchings P. (2004) *Integrative Learning: Mapping the Terrain*. Association of American Colleges and Universities, Washington DC.

Hunt L.A., McGee P., Gutteridge R. & Hughes M. (2012) Assessment of student nurses in practice: A comparison of theoretical and practical assessment results in England. *Nurse Education Today* 32 (4), 351-355.

Huntley-Moore S. (2006) All for One and One for All or Every Student for Themselves? Using Group Posters in the Assessment of the Sociology of Health and Illness. In (eds) *Case Studies of Good Practices in Assessment of Student Learning in Higher Education.* (O' Neill D., Huntley-Moore S. & Race P. eds.) Pp 111-115 AISHE publications, Dublin.

Hutton I.A., Kenealy H., & Wong, C. (2008) Using simulation models to teach junior doctors how to insert chest tubes: A brief and effective teaching module. *Internal Medicine Journal* 38 (10), 887-891.

Huxland M. & Land R.(2000) Assigning students in group projects. Can we do better than random? *Innovations in Education and Training International* 37 (1), 17-22.

Hyland A. (2011) *Entry to Higher Education in Ireland in the 21st century: A discussion paper.* Retrieved from http://www.hea.ie/files/files/file/News/1335_HEA_Conference_01.pdf on 20 November 2012.

Issenberg S.B., McGaghie W.C., Petrusa E.R., Gordon D.L. & Scalese R.J. (2005) Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Medical Teacher* 27 (1) 10-28.

Jacobson M.D. (1966) Effective and ineffective behavior of teachers of nursing as determined by their students. *Nursing Research* 15 (3), 218-224.

James S., D'Amore A. & Thomas T. (2011) Learning preferences of first year nursing and midwifery students: utilising vark. *Nurse Education Today* 31 (5), 417-423.

Jasper K. (2003) *Beginning Reflective Practice.* Nelson Thornes, Cheltenham.

Jay A. (2007) Students' perceptions of the OSCE: a valid assessment tool? *British Journalof Midwifery* 15 (1), 32–37.

Jeffries P.R., Rew S. & Cramer J.M. (2002) A comparison of student-centred versus traditional methods for teaching basic nursing skills in a learning laboratory. *Nursing Education Perspectives* 23 (1), 14-19.

Jeffries, P.R., Woolfe S. & Linde B. (2003) Technology-based vs. traditional instruction: A comparison of two methods for teaching the skill of performing a 12-lead ECG. *Nursing Education Perspectives* 24 (2), 70-75.

Jeffries P.R. (2005) A frame work for designing, implementing, and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives* 26 (2), 96-103.

Jefferies P.R. (ed.) (2007) *Simulation in Nursing Education: From Conceptualization to Evaluation*. National League for Nursing, New York.

Jerome P.J. (1995) *Coaching Through Effective Feedback*. Kogan, London.

Johannesson E., Olsson M., Petersson G. & Silén C. (2010) Learning features in computer simulation skills training. *Nurse Education in Practice* 10 (5), 268-273.

Johns C. (2009) *Becoming a Reflective Practitioner*. 3rd ed. John Wiley & Sons, Chichester.

Jones A., Pegram A. & Fordham-Clarke C. (2010) Developing and examining an Objective Structured Clinical Examination. *Nurse Education Today* 30 (2), 137-141.

Jones J.F., Fitzpatrick J.J. & Rogers V.L. (2012) *Psychiatric – Mental Health Nursing: An Interpersonal Approach.* Springer Publishing Company, New York.

Joy R. & Nickless L.J. (2008) Revolutionising assessment in a clinical skills environment – A global approach: The recorded assessment. *Nurse Education in Practice* 8 (3), 352-358.

Karaksha A., Grant G., Davey A.K. & Anoopkumar-Dukie S. (2011) Development and evaluation of computer-assisted learning (CAL) teaching tools compared to the conventional didactic lecture in pharmacology education. *In Proceedings of EDULEARN11 Conference 2011*. www98.griffith.edu.au/dspace/downloaduriredirect, pp. 1-10.

Kelly M., Lyng C., McGrath M. & Cannon G. (2008) A multi-method study to determine the effectiveness of, and student attitudes to, online instructional videos for teaching clinical nursing skills. *Nurse Education Today* 29 (3), 292–300.

Kennedy M. & Burnett E. (2011) hand hygiene knowledge and attitudes: comparisons between student nurses. *Journal of Infection Prevention* 12 (6), 246 – 250.

Kenny G. (2003) The origins of current nurse education policy and its implications for nurse educators. *Nurse Education Today* 24 (1), 84-90.

Kerlinger F.N. (1986) *Foundations of Behavioural Research*. Holt, Reinhart and Winston, New York.

Khan B.A., Ali F., Vazir N., Barolia R. & Rehan S. (2012) Students' perceptions of clinical teaching and learning strategies: A Pakistani perspective. *Nurse Education Today* 32 (1), 85-90.

Khattab A.D. & Rawlings B. (2001) Assessing nurse practitioner students using a modified objective structured clinical examination (OSCE). *Nurse Education Today* 21 (6), 541-550.

Klein P.D. (1997) Multiplying the problems of intelligence by eight: A critique of Gardner's theory. *Canadian Journal of Education* 22 (3), 377 – 394.

Kneebone R., Kidd J., Nestel D., Asvall S., Paraskevas P. & Darzi, A. (2002) An innovative model for teaching and learning clinical procedures. *Medical Education* 36 (7), 628-634.

Kneebone R. (2005) Evaluating clinical simulations for learning procedural skills. *Academic Medicine* 80 (6), 549-553.

Knowles M.S. (1990) *The Adult Learner: A Neglected Species.* 4th ed. Gulf Publishing, Houston.

Knowles M.S. (1998). *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development*. Gulf Publishing, Houston.

Koch J., Salamonson Y., Rolley J.X. & Davidson P.M. (2011) learning preference A predictor of academic performance in first year accelerated graduate entry nursing students: A prospective follow-up study. *Nurse Education Today* 31 (7), 611-616.

Koerner J. (2003) The virtues of the virtual world: Enhancing the technology / knowledge professional interface for life-long learning. *Nurse Administration Quarterly* 27 (1), 9-17.

Kolb D.A. (1985) *Learning Style Inventory: Technical Manual.* McBer, Boston.

Kornhaber M.L. & Krechevsky M. (1995). Expanding definitions of teaching and learning: notes from the MI underground. In *Transforming Schools* (Cookson P.& Schneider B. eds.) pp 25-55. Garland Press, New York.

Kouzlin A. & Garb E. (2004) Dynamic Assessment of EFL Text Comprehension of at risk students. *European Journal of Psychology of Education* 19 (1), 65–77.

Kramer A.W.M., Jansen J.J.M., Zuithoff P., Du Sman H., Tan L.H.C., Grol R.P.T. & van der Vleuten C.P.M. (2002) Predictive validity of a written knowledge test of skills for an OSCE in postgraduate training for general practice. *Medical Education* 36 (8), 812-819.

Krippendorff K. (2004) *Content Analysis: An Introduction to its Methodology.* 2nd ed. Sage, California.

Kurz J.M., Mahoney K., Martin-Plank L. & Lidicker J. (2008) Objective structured clinical examination and advanced practice nursing students. *Journal of Professional Nursing* 25 (3), 186-191.

Laird T., Shoup R., Kuh G. & Schwarz M. (2008). The effects of discipline on deep approaches to student learning and college outcomes. *Research in Higher Education* 49 (2), 469–494.

Lambert N.M. & McCoombs B.L. (2002) *How Students Learn: Reforming Schools Through Learner-Centred Education.* American Psychological Association,Washington DC.

Lammers R.L., Davenport M. & Korley F. (2008) Teaching and assessing procedural skills using simulation: metrics and methodology. *Academic Emergency Medicine* 15 (11),1079-1087.

Lancaster G.A., Dodd S. & Williamson P.R. (2004) Design and analysis of pilot studies: recommendations for good practice. *Journal of Evaluation in Clinical Practice* 10 (2), 307-312.

Larew C., Lessans S., Spunt D., Foster D. & Covington B.G. (2006) Innovations in clinical simulation: application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives* 27 (1), 16-21.

Lewis M.J., Davies R., Jenkins D. & Tait M.I. (2001) A review of evaluative studies of computer-based learning in nursing education. *Nurse Education Today* 21 (1), 26-37.

Litzinger T.A. & Felder R.M. (2005) A study of the reliability and validity of the Felder-Soloman Index of Learning Styles. *In Proceedings of the 2005 American Society for Engineering Education Annual Conference and Exposition.* pp 1-12.

Livesay G.A., Dee K.C., Nauman E.A. & Hites Jr L.S. (2002). Engineering Student Learning Styles: A Statistical Analysis Using Felder's Index of Learning Styles. *In Annual Conference of the ASEE, Montreal, Quebec, 2002.*

Lo-Binodo-Wood G. & Haber J. (2010) *Nursing Research: Methods and Critical Appraisal for Evidence-Based Nursing.* Mosby, St. Louis.

Löfmark A. & Wikblad K. (2001) Facilitating and obstructing factors for development of learning in clinical practice: a student perspective. *Journal of Advanced Nursing* 34 (1), 43-50.

Love B., McAdams C., Patton D.M., Rankin E.J. & Roberts J. (1989) Teaching Psychomotor skills in nursing: a randomised controlled trial. *Journal of Advanced Nursing* 14 (10), 970-975.

Lovelace M.K. (2005) Meta-analysis of experimental research based on the Dunn and Dunn model. *The Journal of Education Research* 98 (3), 176-183.

Maag M. (2006) *iPod, uPod? An emerging mobile learning tool in nursing education and students' satisfaction. In Who's learning? Whose technology. Proceedings of the 23rd Annual Ascilite Conference:* Retrieved from http://citeseerx.ist.psu.edu on 25 September 2012.

Madden C. (2006) Undergraduate nursing students' acquisition and retention of CPR knowledge and skills. *Nurse Education Today* 26 (3), 218-277.

Manley K. & Garbett R. (2000) Paying Peter and Paul: reconciling concepts of expertise with competency for a clinical career structure. *Journal of Clinical Nursing* 40 (3), 347-359.

Marshall G. & Jones N. (2003) A pilot study into the anxiety induced by various assessment methods. *Radiography* 9, 185e-191.

Marton F. & Säljö R. (1976) On qualitative differences in learning - Outcome and process. *British Journal of Educational Psychology* 46 (1), 4–11.

Marton F. & Säljö, R. (1984) Approaches to learning (Marton F., Hounsell D.J.& Entwhistle N.J. (eds) pp36-55). *The Experience of Learning.* Scottish Academic Press, Edinburgh.

Marquis B.L. & Huston C.J. (2012) *Leadership Roles and Management Functions in Nursing: Theory and Application.* Wolters Kluwer Health, Philadelphia.

Mayers R.E. (2001) *Multimedia Learning*. Cambridge University Press, New York.

MacKenzie K.M. (2009). Who should teach clinical skills to nursing students? *British Journal of Nursing* 18 (7), 395-398.

MacMorris T. (2004) *Acquisition and Performance of Sports Skills.* Wiley & Sons, Chichester.

McCallum J. (2007) The debate in favour of using simulation in preregistration adult nursing. *Nurse Education Today* 27 (9), 825-831.

McChlery S. & Visser S. (2009) A comparative analysis of the learning styles of accounting students in the United Kingdom and South Africa. *Research in Post-Compulsory Education*, 14 (3), 299-315.

McClellan J.A. & Conti G.J. (2008) Identifying the multiple intelligences of your students. *Journal of Adult Education* 37 (1), 13-38.

McEvoy R., Keenanaghan C. & Murray A. (2008) *Service User Involvement in the Irish Health Service: A Review of the Evidence.* Health Service Executive, Dublin.

McGill R.A. (2007) *Motor Learning and Control: Concepts and Applications*. 8th ed. McGraw-Hill, New York.

McIntosh A., Gidman J. & Mason-Whitehead E. (2011) *Key Concepts in Healthcare Education.* Sage Publications, London.

McKeachie W.J. (2002) *McKechie's Teaching Tips, Strategies, Research and Theory for College and University Teachers.* Houghton Mifflin Company, Boston.

McKenna L.G. & Green C. (2004) Experiences and learning during a graduate nurse programme: an examination using a focus group approach. *Nurse Education in Practice* 4 (4), 258–263.

McKenna L.G. & Wellard S.J. (2004) Discursive influences on clinical teaching in Australian undergraduate nursing programs. *Nurse Education Today* 24 (3), 229–235.

McKillup S. (2012) *Statistics Explained. An Introductory Guide for Life Scientists.* Cambridge University Press, Cambridge.

McMullan M., Endacott R., Gray M.A., Jasper M., Miller C.M.L., Scholes J. & Webb C. (2003) Portfolios and assessment of competence: a review of the literature. *Journal of Advanced Nursing* 41 (3), 283-294.

McNamee G., Chen J.Q., Masur A., McCray J. & Melendez L. (2002). Assessing and teaching diverse learners. *Journal of Early Childhood Teacher Educators* 23 (3), 275 – 282.

Medical Research Council (MRC) (2000) *A Framework for Development and Evaluation of RCTs for Complex Interventions to Improve Health.* Retrieved from *www.mrc.ac.uk/consumption/idcplg* on 12 October 2012.

Medley C.F. & Horne C. (2005) Using simulation technology for undergraduate nursing education. *Journal of Nursing Education* 44 (1), 31-34.

Meehan-Andrews T.A. (2009) teaching mode efficiency and learning preferences of first year nursing students. *Nurse Education Today* 29 (1), 24-32.

Merriam S.B. & Caffarella R.S. (1991) *Learning in Adulthood.* Jossey-Bass, San Francisco.

Midgley K. (2005) Pre-registration student nurses perception of the hospital-learning environment during clinical placements. *Nurse Education Today* 26 (4), 338-342.

Miller G.E. (1990) The assessment of clinical skills / competence / performance. *Acad Me* 65 (9), 63-67.

Mills J.E., Francis K.L., & Bonner A. (2005) Mentoring, clinical supervision and preceptoring: clarifying the conceptual definitions for Australian rural nurses. A review of the literature. *The International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy*. Retrieved from http://rrh.deakin.edu.au on13 January 2013.

Mitchell M.L., Henderson A., Groves M., Dalton M & Nulty D.D. (2009) The objective clinical structured clinical examination (OSCE): Optimising its value in the undergraduate nursing curriculum. *Nurse Education Today* 29 (4), 398-404.

Moon J. (2002) *The Module and Programme Development Handbook: A Practical Resource for Linking Levels, Learning Outcomes and Assessment.* Kogan Page, London.

Moonie Simmie G. (2010) Reflections on themes and concerns at the heart of practice. *Teaching and Leaning: Insights from Irish Schools* 2 (1), 7-17.

Moran, S., Kornhaber, M., & Gardner, H. (2006). Orchestrating multiple intelligences. *Educational Leadership* 64 (1), 22-27.

Morgan P.J., Cleave-Hogg D. & Desousa S. (2006) Applying theory to practice in undergraduate education using high fidelity simulation. *Medical Teacher* 28 (1), e10–e15.

Moule P., Wilford A., Sales R. & Lockyer L. (2008) Student experiences and mentor views of the use of simulation for learning. *Nurse Education Today* 28 (6), 790–797.

Murphy P. & Moon B. (eds) (1994) *Developments in Learning and Assessment.* The Open University, London.

Murray C., Grant M., Howarth, M.L. & Leigh J. (2008) The use of simulation as a teaching and learning approach to support practice learning. *Nurse Education in Practice* 8 (1), 5–8.

Myrick F. & Yonge O. (2002) Preceptors behaviours integral to the promotion of student critical thinking. *Journal for Nurses in Staff Development* 18 (3), 127–133.

National Quality Authority Ireland (2004) *Consultative Paper - Draft policies and criteria for the inclusion of awards in the National Qualifications Framework.* NQAI, Dublin.

Neary M. (2000) *Teaching, Assessing and Evaluating for Clinical Competence: A Practical Guide for Practitioners and Teachers.* Nelson Thornes, Cheltenham.

Nehring E. & Lashley F.R. (2009) Human patient simulators in nursing education: An overview. *Simulation and Gaming* 32 (2), 194-204.

Nelson Laird, T. F., Shoup R., Kuh, G. D. & Schwarz M. J. (2008). The effects of discipline on deep approaches to student learning and college outcomes. *Research in Higher Education* 49 (5), 469-494.

Newble D. (2004) Techniques for measuring clinical competence: objective structured clinical examinations. *Medical Education* 38 (3), 199-203.

Nickless L.J. (2011) The use of simulation to address the acute care skills deficit in pre-registration nursing students: A clinical skill perspective. *Nurse Education in Practice* 11 (3), 199-205.

Nicol M. & Freeth D.(1998) Learning clinical skills: an interprofessional approach. *Nurse Education Today* 18 (5), 455-461.

Nicol D. (2006) Increasing success in first year courses: assessment redesign, self-regulation and learning technologies. *In proceedings of conference ASCILITE, Sydney*.

Nijhuis J., Segers M., & Gijselaers W. (2008) The extent of variability in learning strategies and students' perceptions of the learning environment. *Learning and Instruction* 18 (1), 121–134.

Nitko A.J. (1995) Curriculum-based Continuous Assessment: a framework for concepts, procedures and policy. *Assessment in Education: Principles, Policy and Practice* 2 (3), 321-337.

Nulty D.D., Mitchell M.L., Jeffrey C.A. & Groves M. (2011) Best Practice Guidelines for use of OSCEs: Maximising value for student learning. *Nurse Education Today* 31 (1), 145-151.

Nursing and Midwifery Council (2005) *Proposals Arising from a Review of Fitness to Practice at the Point of Registration.* Nursing and Midwifery Council, London.

Nursing and Midwifery Council (2008) *Standards to Support Learning and Assessment in Practice*. Nursing Midwifery Council, London.

Nursing and Midwifery Council (2010) *Essential Skills Clusters and Guidance for Their Use*. *Standards for Pre-Registration Nursing Education.* Nursing Midwifery Council, London.

Nursing and Midwifery Council (2012) *Statistical Analysis of the Register: Analysis of Diversity Data: 2011.* Retrieved from http://www.nmc.uk.org. on 22 September 2012.

O'Connor J. & Brunton E. (2003) *An investigation into Howard Gardner's theory of multiple intelligences and the possible relationship with academic results.* BSc. Project in Health and Leisure, Tralee, Tralee Institute of Technology.

O'Shea Y. (2008) *Nursing and Midwifery in Ireland: A Strategy for Professional Development in a Changing Health Service.* Blackhall Publishing, Dublin.

Oermann M.H. (1990) Psychomotor skill development. *Journal of Continuing Education in Nursing* 21(5), 202-204.

Oermann M.H., Kardong-Edgren S.E. & Odom-Maryon T. (2011) Effects of monthly practice on nursing students' CPR psychomotor skill performance. *Resuscitation* 82 (4), 447-453.

Olsen R.K. (1999) Teaching psychomotor nursing skills in simulated learning labs: A critical review of the literature. *Evidenced-based Teaching: Current Research in Nursing Education.* Jones and Bartlett, Sudbury.

Olson M.H. & Hergenhahn B.R. (2009) *An Introduction to Theories of Learning.* 8th ed. Pearson International Edition, New York.

Ong N.T., Bowcock A. & Hodges N.J. (2010) Manipulations to the timing and type of instructions to examine motor skill performance under pressure. *Frontiers in Psychology* 1 (1), 1-13.

Owens L. & Waldon D. (2001) Peer instruction in the learning laboratory- a strategy to decrease student anxiety. *Journal of Nursing Education* 40 (8), 375-377.

Özdermir P., Güneysu S. & Tekkaya C. (2006) Enhancing learning through multiple intelligences. *Educational Research* 40 (2), 74-78.

Palese A., Bulfone G., Venturato E., Urli N., Bulfone T., Zanini A., Fabris S., Tomietto M., Comisso I., Tosolini C., Zuliani S. & Dante A. (2011) The cost of the objective

structured clinical examination on an Italian nursing bachelor's degree course. *Nurse Education Today* 32 (4), 422-426.

Parahoo K. (2006) *Nursing Research: Principles, Process and Issues.* 6th Ed. Palgrave MacMillan, Hampshire.

Park R.S., Chibnall J.T., Blaskiewicz R.J., Furman G.E., Powell J.K. & Mohr C.J. (2004) Construct validity of an objective structured clinical examination (OSCE) in psychiatry: Associations with the clinical skills examination and other indicators. *Academic Psychiatry* 28 (1), 122-128.

Parr M.B. & Sweeney N.M. (2006) Use of human patient simulation in an undergraduate critical care course. *Critical Care Nursing Quarterly* 29 (2), 188–198.

Pashler H., McDaniel M., Rohrer D. & Bjork R. (2009) Learning styles: Concepts and evidence. *Psychological Science in the Public Interest 9* (3), 105–119.

Patton M.Q. (2002) *Qualitative Research and Evaluation Methods.* 3rd ed. Sage Publications, London.

Peariso J.F. (2008) Multiple intelligence or multiple misleading? The critic's view of multiple intelligences theory. Spring. Online submission. Retrieved from http://www.eric.ed.gov/PDFS/ED500515.pdf on 6th September 2012.

Peplau H.E. (1991) *Interpersonal Relations in Nursing: A Conceptual Frame or Reference for Psychodynamic Nursing.* Spring Publishing Company, New York.

Perin D. (2002) *Literacy Education after High School*. Eric Digest, New York.

Peterson M. & Bechtel G. (2000) Combining the arts: an applied critical thinking approach in the skills laboratory. *Nursing Connections* 13 (2), 43–49.

Pettigrew A.C., Dienger M. & O' Brien King M. (2011) Nursing students today: who are they and what are their learning preferences? *Journal of Professional Nursing* 27 (4), 227-236

Phaneuf, M. (2006). Defense Mechanisms among Our Students. Infiressources, Educational Crossroad, section. Retrieved from http://www.infiressources.ca/fer/Depotdocument_anglais/Defense_Mechanisms_aong_Our_Students.pdf on 9th September 2012.

Piaget J. (1981). *Intelligence and Affectivity: Their Relationship during Child Development.* Annual Reviews, Palo Alto.

Pittet D. (2000) Improving compliance with hand hygiene in hospitals. *Infection Control Hospital Epidemiology* 21 (3), 381e- 386e.

Pizarro S.R. (2003). Psychometric analyses of the multiple intelligences developmental assessment scales. *In The Annual Conference of the American Educational Research Association (AERA), Chicago, Ill.*

Platsidou G. & Metallidou S. (2009) Validity and reliability issues of two learning style inventories in a Greek sample: Kolb's Learning Style Inventory and Felder and Soloman's Index of learning Styles. *International Journal of Teaching and Learning in Higher Education* 20 (3), 324-335.

Polifroni E.C., McNulty J. & Allchin L. (2003) Medication errors: More basic than a system issue. *Journal of Nursing Education* 42 (10), 455-458.

Polit D.F & Beck C.T. (2008) *Nursing Research: Generating and Assessing Evidence for Nursing Practice.* 8th ed. Lippincott William & Wilkins, Philadelphia.

Polit D.F. & Hungler B.P. (2010) *Nursing Research: Principles and Methods.* 9th ed. Lippincott, Williams & Wilkins, Philadelphia.

Potter P., Wolf L., Boxerman S., Grayson D., Sledge J., Dunagan C. & Evanoff B. (2005) An analysis of nurse's cognitive work: A new perspective for understanding medical errors. *Advances in Patient Safety: From Research to Implementation* 1 (1), 39-51.

Pritchard A. (2009) *Ways of Learning: Learning Theories and Learning Styles in the Classroom.* Routledge, Abingdon.

Quinn F.M. & Hughes S.J. (2007) *Principles and Practice of Nurse Education.* 5th ed. Stanley Thornes, Wiltshire.

Race P. (2005) *Making Learning Happen: A Guide for Post-compulsory Education*. Sage (Paul Chapman) Publications, London.

Radhakrishnan K., Roche J.P. & Cunningham H. (2007) Measuring clinical practice parameters with human patient simulation. *International Journal of Nursing Education Scholarship* 4 (1), 1-11.

Raines D.A. & Lynn C.E. (2010) Nursing practice competency of accelerated bachelor of science in nursing program students. *Journal of Professional Nursing* 26 (3),162–167.

Raisler J., O' Grady M. & Lori J. (2003) Clinical teaching and learning in midwifery and women's health. *The American College of Nurse Midwives* 48 (6), 398-406.

Ramsden P. (2003) *Learning to Teach in Higher Education.* 2nd Ed. Routledge Falmer, London.

Ramsey M.A.E. (2001) Conflict in the healthcare workplace. *Baylor University Medical Centre Proceedings* 14 (2), 138-140.

Randle J., Clark M. & Storr J. (2006) Hand hygiene compliance in healthcare workers. *Journal of Hospital Infection* 64 (3), 205-209.

Rassool G. & Rawaf S. (2008) the influence of learning styles preference of undergraduate nursing students on education outcomes in substance use education. *Nurse Education in Practice* 8 (5), 306-314.

Ravert P. (2002) An integrative review of computer-based simulation in the education process. *CIN: Computers, Informatics, Nursing* 20 (5), 203-208.

Rayner S. (2007) A teaching elixir, learning chimera or just fool's gold? Do learning styles matter? *Support for Learning* 221(1), 24-30.

Redfern S., Norman I. & Calman L. (2002) Assessing competence to practise in nursing: a review of the literature. *Research Papers in Education* 17 (1), 51-77.

Reid G. (2005) *Learning Styles and Inclusion.* Paul Chapman Publishing, London.

Reilly D.E. & Oermann M.H. (1990) *Behavioural Objectives: Evaluation in Nursing.* 3rd ed. National league for Nursing, Missouri.

Rennie A.M. & Main M. (2006) Student midwives' views of objective structured clinical examination. *British Journal of Midwifery* 14 (10), 602-607.

Reznick R.K & MacCrae H. (2006) Teaching surgical skills – changes in the wind. *New England Journal of Medicine* 355 (12), 2664-2669.

Richardson V. (2005) The diverse learning needs of students In *Teaching in Nursing,* (Billings D.M. & Halstead J.A.2nd ed) pp21-41. Elsevier Saunders, Missouri.

Rosati P.A. & Felder RM. (1995) Engineering student responses to an Index ofLearning Styles. *Proceedings 1995 ASEE Conference Exposition.* Washington DC: American Society for Engineering Education. Retreived from http://www.me.mtu.edu on 12th September 2011.

Rose M. & Best D. (2005) *Transforming Practice through Clinical Education, Professional Supervision and Mentoring.* Churchill Livingstone, London.

Rowntree D. (1987) *Assessing Students: How Shall we Know Them?* 2nd Ed. Kogan Page, Kogan.

Røykenes K. & Larsen T. (2010) The relationship between nursing students' mathematics ability and their performance in a drug calculation test. *Nurse Education Today* 30 (7), 697-701.

Rush S., Firth T., Burke L. & Marks-Maran D. (2012) Implementation and evaluation of peer assessment of clinical skills for first year student nurses. *Nurse Education in Practice* 12 (4), 219-226.

Rushforth H.E. (2006) Objective structured clinical examination (OSCE): Review of literature and implications for nursing education. *Nurse Education Today* 27 (5), 481-490.

Rust C., Price M. & O' Donovan B. (2003) Improving students' learning by developing their understanding of assessment criteria. *Assessment and Evaluation in Higher Education* 28 (2), 147-164.

Ruth-Sadd L.A. (2003) Reflective Practice: A Critical Analysis of Data-Based Studies and Implications for Nursing Education. *Journal of Nursing Education* 42 (11), 488-497.

Sadler-Smith, E. & Smith P. J. (2004) Strategies for accommodating individuals' styles and preferences in flexible learning programmes. *British Journal of Educational Technology* 35 (4), 395–412.

Saididen H. & Kneebone R. (2012) Practical skills teaching in contemporary surgical education: how can educational theory be applied to promote effective learning? *The American Journal of Surgery* 204 (4), 396-401.

Saito H. & Miwa K. (2007) Construction of a learning environment supporting learners' reflection: a case of information seeking on the web. *Computers & Education* 49 (2), 214–229.

Saks, M. & Allsop, J. (2007). *Health Research Sampling Methods*. Sage Publications, London.

Salkind N.J. (2000). *Statistics for People Who (think they) Hate Statistics.* Sage Publications, Inc., New York.

Salyers V.L. (2007) Teaching psychomotor skills to beginning nursing students using a web-enhanced approach: A quasi-experimental study. *International Journal of Nursing Education Scholarship* 4 (1), 1-12.

Sand-Jecklin K. (2006) The impact of active/cooperative instruction on beginning nursing student learning strategy preference. *Nurse Education Today* 27 (5), 474–480.

Sarantakos S. (2005) *Social Research.* 3rd ed. Palgrave Macmillan, Hampshire.

Schaefer KM. & Zygmont D. (2003) Analyzing the teaching style of nursing faculty: does it promote a student-centered or teacher-centered learning environment? *Nursing Education Perspectives* 24 (5), 238–245.

Schiavenato M. (2009) Re-evaluating simulation in nursing education beyond the human patient simulator. *The Journal of Nursing Education* 48 (7), 388-394.

Schmidt R.A. & Wrisberg C.A. (2004) *Motor learning and Performance: A Situation Based Learning Approach.* 4th ed. Human Kinetics, Champaign.

Schon D. (1990) *Educating the Reflective Practitioner*. Jossey-Bass, San Francisco.

Schunk D.H. & Ertmer P.A. (2000) Self-regulation and academic learning—self-efficacy enhancing interventions. In *Handbook of Self-Regulation* (Boekaerts M.,. Pintrich PR., and Zeidner M. eds.) pp 631–649. Academic Press, San Diego.

Sedlack R.E., Kolars J.C. & Alexander J.A. (2004) Computer simulation training enhances patient comfort during endoscopy. *Clinical Gastroenterology and Hepatology* 2 (3), 348-352.

Seery N., Gaughran W. F. & Waldmann T. (2003). Multi-modal learning in engineering education. *In Proceedings, Conference and Exposition.* American Society for Engineering Education, Washington DC.

Selim A.A., Ramadan F.H., El-Gueneidy M.M. & Gaafer M.M. (2012) Using Objective Structured Clinical Examination (OSCE) in undergraduate psychiatric nursing education: Is it reliable and valid? *Nurse Education Today* 12 (4), 219-226.

Shaddish W.R, Cook T.D & Campell D.T. (2002) *Experimental and Quasi-Experimental Designs for Generalized Causal Inference.* Houghton Mifflin, Boston.

Sharp K.J., Wilcock S.E., Sharp D.M.M. & MacDonald H. (1995) *A Literature Review on Competence to Practice*. National Board for Nursing, Midwifery & Health Visiting for Scotland, School of Nursing, The Robert Gordon University, Edinburgh.

Shearer B. (1994) *The MIDAS: A Professional Manual.* MI Research and Consulting, Inc., Kent.

Shearer B. & Jones J. A. (1994) The validation of the Hillside Assessment of Perceived Intelligences: A measure of Howard Gardner's theory of multiple intelligences. In *The American Educational Research Association,* New Orleans.

Shearer B. (1996a) *Common Miracles in the Classroom.* Greydon Press, Ohio

Shearer B. (1996b) *The MIDAS: A Professional Manual.* Greydon Press, Ohio

Shearer B. (1999) *The Challenge! A MIDAS Guide to Career Success*. MI Research and Consulting Inc., Ohio

Shearer B. (2004) Using a multiple intelligences assessment to promote teacher development and student achievement. *Teachers College Record* 106 (1), 147 – 162.

Shepherd I.A., Kelly C.M., Skene F.M. & White K.M. (2007) Enhancing graduate nurses' health assessment knowledge and skills using low-fidelity adult human simulation. *Simulation in Healthcare* 2 (1), 16-25.

Shuttleworth C., Rudd C.J., Smith P., Combs S. & Wain T. (2008) The experience of faculty practice: Developing and evaluating a newly established program. *Nurse Education Today* 28 (6), 702-710.

Silver H., Strong R. & Perini M. (1997) Integrating learning styles and multiple intelligences. *Educational Leadership* 55 (1), 22-27.

Silver H., Strong R. & Perini M. (2000) *So Each May Learn: Integrating Learning Styles and Multiple Intelligences*. West Virginia USA: Association for Supervision and Curriculum Development, Alexandria.

Silverman J. & Wood D.F. (2004) New approaches to learning clinical skills. *Medical Education* 38 (10), 1020–1023.

Simons H., Clarke J.B., Gobbi M. & Long G. (1998) *Nurse Education and Training Evaluation in Ireland: Final report.* University of Southampton, Southampton.

Smith K.K, Gilcrest D. & Pierce K. (2008) Evaluation of staff's retention of ACLS and BLS skills. *Resuscitation* 78 (1), 59-65.

Snelgrove S.R. (2004) Approaches to learning of student nurses. *Nurse Education Today* 24 (7), 605-614.

Sparks R.L. (2006) learning styles – making too many "wrong mistakes": A response to Castro and Peck. *Foreign Language Annals* 39 (3), s20-s28.

Staib S. (2003) Teaching and measuring critical thinking. *Journal of Nursing Education* 42 (5), 495-485.

Stanczyk M.M. (2011) Music therapy in supportive cancer care. *Reports of Practical Oncology and Radiotherapy* 16 (5), 170-172.

Standards and Guidelines for Quality Assurance in the European Higher Education Area (2005). The European Association for Quality Assurance in Higher Education. [online]. Retrieved from: http://www.bolognabergen2005. no/Docs/00 Main_doc/050221_ENQA_report.pdf. on 22nd October 2012.

Staun M., Bergström B. & Wadensten B. (2010) Evaluation of a PBL strategy in clinical supervision of nursing students: Patient-centred training in student-dedicated treatment rooms. *Nurse Education Today* 30 (7), 631–637.

Stayt L.C. (2011) Clinical simulation: A sine qua non of nurse education or a white elephant? *Nurse Education Today* 32 (5), e23-e27.

Stayt L.C. & Merriman C. (2012) A descriptive survey investigating pre-registration student nurses' perceptions of clinical skill development in clinical placements. *Nurse Education Today* In press corrected proof. Doi http://dx.doi.org/10.1016/j.nedt.2012.10.018.

Sternberg R.J. (1996). Myths, counter myths and truths about intelligence. *Educational Researcher* 25 (2), 11 – 16.

Strean W. (2011) Creating student engagement? HMM: Teaching and learning with humor, music, and movement. *Creative Education* 2 (3), 189-192.

Struyven K., Dochey F. & Janssens S. (2005) Students' perceptions about evaluation and assessment in higher education: a review. *Assessment and Evaluation in Higher Education* 30 (4), 325-341.

Suhre C.J. & Harskamp E.G. (2001) Teaching planning and reflection in nurse education. *Nurse Education Today* 21 (5), 373–381.

Suk W.A., Murray K. & Avakian M.D (2003) Environmental hazards to children's health in the modern world. *Mutation Research/Reviews in Mutation Research* 544 (2-3), 235 -242.

Sulaiman T., Silaiman S. & Wei Hui S. (2011) Integrating multiple intelligences and technology into classroom instruction to transform instructional practice in Malaysia. *Journal of Language, Teaching & Research* 2 (5), 1-15.

Suskie L. (2006) *Using Five Dimensions of Good Assessment.* Retrieved from planning.iupui.edu/page/download/?key.../**suskie**.pdf. on 4th November 2011.

Tajularipin S., Abdurham A.R. & Rahim S.S.A. (2010) Teaching strategies based on multiple intelligence theory among science and mathematics secondary school teachers. *Procedia Social and Behavioural Science,* 8, 512-518. Retrieved from http://www.sciencedirect.com on 20th March 2012.

Tan M. & Grigorenko E.L. (2010) Where creativity and curriculum meet. *New Horizons for Learning Journal* 5(2), 15-22.

The Patients' Association (2009) *Patients not Numbers. People…not Statistics.* Patients' Association, London.

Thomas S. & Hinchcliff K. (2008) *Improving Clinical Skills Facilities in NHS Yorkshire and the Humber.* Retrieved from www.yorksandhumber.nhs.uk on 09 January 2012.

Thompsom C. & Crutchlow E. (1993) Learning style research: a critical review of the literature and implications for nursing education. *Journal of Professional Nursing* 9 (1), 34-40.

Thompson C., McCaughan D., Cullum, N., Sheldon, T., Thompson, D., & Mulhall, A. (2002) *Nurses' Use Of Research Information In Clinical Decision Making: A Descriptive and Analytical Study Report to the NHS Research and Development Programme.* Department of Health, London.

Tong A., Sainsbury P. & Craig J. (2007) Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal of Qualitative Health Care* 19 (6),349-357.

Trick W.E.,Vernon M.O., Welbel S.F., DeMarais P., Hayden M.K. & Weinstein R.A. (2007) Multicentre intervention program to increase adherence to hand hygiene recommendations and glove use to reduce the incidence of antimicrobial resistance. *Infection Control and Hospital Epidemiology* 28 (1), 42-49.

Trotter E. (2006) Student perception of continuous summative assessment. *Assessment and Evaluation in Higher Education* 31 (5), 505-521.

Tully A. (2002) Levels of Distress, Sources of Stress and Ways of Coping among Psychiatric Nursing Students. *Proceeds for the 21st Annual Nursing Research Conference, Dublin.*

Vandaveer M. & Norton B. (2005) From teaching to learning: Theoretical Foundations. In *Teaching in Nursing: A Guide for Faculty* (Billings D.M. & Halstead J.A. 2nd Ed.) pp231-282. Elsevier Saunders, Missouri.

van de Waterling G., Gijbels D., Dochy F. & van der Rijt L. (2008) Students' assessment preferences, perceptions of assessment and their relationships to study results. *Higher Education* 56 (6), 645-658.

van Herzeele I., Neequaye S., Darzi A., Vermassen F. & Cheshire N.J. (2008) Cognitive training improves clinically relevant outcomes during simulated endovascular procedures. *Journal of Vascular Surgery* 48 (5), 1223-1230.

van Zwanenberg N., Wilkinson L.J. & Anderson A. (2000) Felder and Silverman's Index of Learning Styles and Honey and Mumford's Learning Styles Questionnaire: how do they compare and do they predict academic performance? *Educational Psychology* 20 (3), 365-380.

Verhoeven B.H., Hamers J.G.H.C., Scherpbier A.J.J.A., Hoogenboom R.J.I.& van der Vleuten G.P.M. (2000) The effect on reliability of adding a separate written assessment component to an objective structured clinical examination. *Medical Examination* 34 (6), 525-529.

von Elm E., Altman D.G., Egger M., Pocock S.J., Gøtzsche P.C. & Vandenbroucke J.P. (2008) STROBE Initiative. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *Journal of Clinical Epidemiol* 61 (4), 344-349.

von Glassersfeld E. (1995). *Radical Constructivism: A Way of Knowing and Learning.* Falmer Press, Washington DC.

von Glasersfeld, E. (1996) Introduction: Aspects of constructivism. In *Constructivism: Theory, Perspectives, and Practice* (Fosnot C.T. ed.) pp3-7. Teacher College Press, New York.

Vygotsky L.S. (1978) *Mind in Society: The Development of Higher Mental Processes*. Harvard University Press, Cambridge.

Walsh M., Hill-Bailey P. & Koren I. (2009) Objective structured clinical evaluation of clinical competence: an integrative review. *Journal of Advanced Nursing* 65 (8), 1584-1595.

Warburton P. & Kahn P. (2007) Improving the numeracy skills of nurse prescribers *Nursing Standard* 21 (28), 40-43.

Waterhouse L. (2004) Multiple intelligences, the Mozart effect, and emotional intelligence: A critical review. *Educational Psychologist* 41 (4), 207-225.

Watson R.R. (2002) Clinical competence: Starship enterprise or straitjacket? *Nurse Education Today* 22 (7), 476-480.

Watson R.R., Stimpson A., Topping A. & Porock D. (2002) Clinical competence assessment in nursing: a systematic review of the literature. *Journal of Advanced Nursing* 39 (5), 421-431.

Weber E. (1999) *Student Assessment that Works: A Practical Approach*. Needham Heights Zephyr Press, Arizona.

Weber E. (2000) *Five-phases to PBL: MITA model for Redesigned Higher Education Classes. Problem-based learning: Educational Innovation across Disciplines.* Tamasek Centre for Problem-Based Learning, Singapore.

Weber E. (2005) *MI strategies in the Classroom and Beyond: Using Roundtable Learning*. Pearson Publishers, New York.

Wellard S.J., Solvoll B.A. & Heggen K.M. (2009) Picture of Norwegian clinical learning laboratories for undergraduate nursing students. *Nurse Education in Practice* 9 (4), 228-235.

Wells J.S.G. & Norman I.J. (2009) The 'Greying' of Europe – Reflections on the state of nursing and nurse education in Europe *Nurse Education Today* 29 (8), 811-815.

Welsh L. & Swan C. (2002) *Partners in Learning: A Guide to Support and Assessment in Nurse Education.* Radcliffe Medical Press, Abingdon.

Wessel J., Williams R., Finch E. & Gemus M. (2003) Reliability and validity of an objective structured clinical examination for physical therapy students. *Journal of Allied Health* 32 (4), 266-269.

West S., Clark T. & Jasper M. (2007) *Enabling Learning in Nursing and Midwifery Practice.* John Wiley & Sons Ltd.,West Sussex.

Wetzig S.M. (2004) *Learning Style Preferences and Learning Strategies in Intensive Care Nurse Education*. Queensland, Transition to Intensive Care Nurse Education Programme (Unpublished),

Whitby M., Pessoa-Silva C.L., McLaws L., Allegranzi B., Sax H., Larson E., Seto W.H., Donaldson L. & Pittet D. (2007) Behavioural considerations for hand hygiene practices: the basic building blocks. *Journal of Hospital Infection* 65 (2), 1-8.

Williams A.N. & Hodges M.J. (eds) (2004) *Skill Acquisition in Sport: Research, Theory and Practice.* Routledge, Oxon.

Williams J. & Stickley T. (2010) Empathy and nurse education. *Nurse Education Today* 30 (8), 752-755.

Willingham D.T. (2004) Check the facts: Reframing the mind. *Education Next* 4 (3), 19-25. Retrieved from http://educationnext.org.files on 06 November 2012.

Wiswell A., Hardy C.R. & Reio T.G. (2001) An examination of the multiple intelligences developmental assessment scales (MIDAS). *In Paper presented at the annual meeting of the Academy of Human Resource Development*, Tulsa.

Wood, I., Douglas, J., & Priest, H. (2004) Education and training for acute care delivery: a needs analysis. *Nursing in Critical Care* 9 (4), 159-166.

Woolley N.N. & Jarvis Y. (2007) Situated cognition and cognitive apprenticeship: A model for teaching and learning clinical skills in a technologically rich and authentic learning environment. *Nurse Education Today* 27 (1), 73-79.

World Health Organisation (2009) *WHO Guidelines on Hand Hygiene in Healthcare*. WHO, Geneva.

Wright K. (2008) Can effective learning an detaching strategies help student nurses to retain drug calculation skills? *Nurse Education Today* 28 (7), 856-864.

Wright K. (2012) How do nurses solve drug calculation problems? *Nurse Education Today* In Press, Corrected Proof doi:10.1016/j.nedt.2012.04.009.

Yonker J.E. (2011) The relationship of deep and surface study approaches on factual and applied test-bank multiple-choice question performance. *Assessment & Evaluation in Higher Education* 36 (6), 673-686.

Yoong S. (2001) Multiple intelligences: A construct validation of the MIDAS scale in Malaysia. *In The International Conference on Measurement and Evaluation, Penang, Malaysia.*

Zabalegui A., Macia L., M'arquez J., Ricom R., Nuin C., Mariscal P., Germ'an C. & Moncho J. (2006) Changes in nursing education in the European Union. *Journal of Nursing Scholarship* 38 (2), 114-118.

Zhang H. & Lambert V. (2008) Critical thinking dispositions and learning styles of baccalaureate nursing students from China. *Nursing and Health Sciences* 10 (2), 175–181.

Ziv A., Small S.D. & Wolpe W.R. (2007) Patient safety and simulation-based medical education. *Medical Teacher* 22 (5), 489-495.

Zywno M.S. (2003). A Contribution of Validation of Score Meaning for Felder-Soloman's Index of Learning Styles. *In Proceedings of the 2003 Annual ASEE Conference.* Washington, DC: ASEE

Appendix-1-Pre-registration nursing competencies

Pre-registration nursing competencies

The five domains of competence include:

Professional Values and the role of the nurse
Nursing Practice and clinical decision making
Knowledge and cognitive competences
Communication and interpersonal competences (including technology for communication or health informatics)
Leadership, management and team competences

The original competences taken from the TUNING project:

Competences associated with the professional values and the role of the nurse
1) Practises within the context of professional, ethical, regulatory and legal codes, recognising and responding to moral/ethical dilemmas and issues in day to day practice.
2) Practices in a holistic, tolerant, non judgmental, caring and sensitive manner, ensuring that the rights, beliefs and wishes of different individuals and groups are not compromised.
3) Educates, facilitates, supports and encourages the health, well-being and comfort of populations, communities, groups and individuals whose lives are affected by ill health, distress, disease, disability or death.
4) Is aware of the different roles, responsibilities and functions of a nurse, and is able to adjust their role to respond effectively to population/ patient needs. Where necessary and appropriate is able to challenge current systems to meet population/patient needs.
5) Accepts responsibility for his/her own professional development and learning, using evaluation as a way to reflect and improve upon on his/her performance and to enhance the quality of service delivery.
Competences associated with nursing practice and clinical decision making
6) Undertakes comprehensive and systematic assessments using the tools/frameworks appropriate to the patient/client taking into account relevant physical, social, cultural,

psychological, spiritual and environment factors.
7) Able to recognise and interpret signs of normal and changing health/ill health, distress, or disability in the person (assessment/diagnosis).
8) Responds to patient/client needs by planning, delivering and evaluating appropriate and individualised programmes of care working in partnership with the patient/client, their carers, families and other health/social workers.
9) Able to critically question, evaluate, interpret and synthesis a range of information and data sources to facilitate patient choice, and to make sound clinical judgments to ensure quality standards are met and practice is evidence based.
10) Able to appropriately use a range of nursing skills, interventions/activities to provide optimum care. For example: a) maintains patient/client dignity, privacy and confidentiality; b) practise principles of health and safety, including moving and handling, infection control; essential first aid and emergency procedures; c) safely administers medicines and other therapies; d) considers emotional, physical and personal care, including meeting the need for comfort, nutrition, personal hygiene and enabling the person to maintain the activities necessary for daily life; e) responds to individuals needs through the life span and health/illness experience e.g. pain, life choices, revalidation, invalidity or when dying; f) informs, educates and supervises patient/carers and their families.
Knowledge and cognitive competences
11) Has relevant knowledge of the following and can appropriately apply this knowledge to nursing practice, patient care and situations of uncertainty: a) Theories of nursing and nursing practice b) Natural and life sciences c) Social, health and behavioural science d) Ethics, law and humanities e) Technology and health care informatics

f) International and national policies g) Problem solving and decision making h) Principles of research and enquiry
Communication and interpersonal competences **(including technology for communication)**
12) Able to communicate effectively (including the use of technology): with patients, families and social groups, including those with communication difficulties.
13) Enables patients and their carers to express their concerns and worries and can respond appropriately e.g. emotional, social, psychological, spiritual or physical.
14) Able to appropriately represent the patient/client's perspective and act to prevent abuse.
15). Can use a range of communication techniques to promote patient well being. For example the ability to appropriately: a) use counselling skills; b) identify and manage challenging behaviour; c) recognise anxiety, stress and depression; d) give emotional support and identify when specialist counselling or other interventions are needed
16) Able to accurately report, record, document and refer care using appropriate technology.
Leadership, management and team competences
17) Realises that patient/client well-being is achieved through the combined resources and actions of all members of the health/social care team, and is able to lead and co-ordinate a team, delegating care appropriately.

18) Able to work and communicate collaboratively and effectively with all support staff to prioritise and manage time effectively while quality standards are met.
19) Able to assess risk and actively promote the well-being, security and safety of all people in the working environment (including themselves).
20) Critically uses tools to evaluate and audit care according to relevant quality standards.
21) Within the clinical context, is able to educate, facilitate, supervise and support health care students and other health/social care workers.
22) Is aware of the principles of health/social care funding and uses resources effectively

Appendix-2- Literature search terms: The effect of learning and teaching for the acquisition of psychomotor skills in a simulated environment and table of included studies.

Subject headings and free text terms used in literature search.

Element 1	**Element 2**	**Element 3**
Clinical laboratories	Clinical skills	Student nurse$
Skills laboratories	Psychomotor skills	Nursing student$
Nursing laboratory	Motor skills	Undergraduate nurse
Nursing skills laboratory	Skills acquisition	Baccalaureate nurse$
Simulated environment	Psychomotor performance	Nurse$
Simulation education	Acquiring skill$	Novice nurse$
Clinical simulation	Skills performance	Learner
High fidelity simulation	Nursing procedure$	Student
Low fidelity simulation	Clinical procedure$	
Partial task trainer	Skills training	
Human patient simulator	Skills preparation	
Mannequin	Technical proficiency	
Manikin	Simulation	
Mannekin	Teaching methods	
	Teaching strategy	
	Learning strategy	
	Knowledge acquisition	
	Learning	
	Teaching	
	Education	
	Nurse education	
	Measuring skills performance	
	Skills transfer	
	Skill development	

Reference and location	Design and sample	Instruments and data collected	Key findings	Rating
Ackerman 2009 USA	Experiment Cohort study n=65 junior nursing students (response rate not reported; random allocation to I & C Groups at baseline data collection) I *n*=32; C *n*=33 at baseline I *n*=24; C *n*=25 at 3 months Intervention = simulator experience Single site study	CPR knowledge (14-item MCQ) at baseline, post-intervention & 3 months CPR skills at post-intervention & 3 months	At baseline no differences between I and C Groups re. knowledge or skills Both I & C Group knowledge scores ↑post-intervention; I Group had higher scores post-intervention (p=0.015) & at 3 months (p=0.002) I Group had higher skills scores post-intervention (p<0.001) & at 3 months (p< 0.001)	Weak
Alinier 2003 UK	Survey Cohort sample n = 125 (*n* =86 nursing students ; *n*=39 nursing lecturers; response rate not reported) Single site study	Questionnaires (student information 5 point Likert scale & lecturer information 5 point Likert scale)	Students +ve about educational benefit of OSCEs; preparation for clinical practice; development of confidence, motivation & mode of assessment. Student –ve about feedback Lecturers +ve about development of confidence; ability to reflect & benefit of OSCE for student development. Lecturers –ve about student & lecturer preparation for OSCE process	Weak
Alinier et al. 2004 United Kingdom	Experiment Convenience sample *n* =67 2nd Year nursing students (66.3% response rate) I *n*=29; C *n*=38 at baseline & 6 months post-intervention Intervention = simulator experience Single site study	OSCE at baseline & 6 months post-intervention Confidence questionnaire (5 point Likert scale) post-intervention Stressfulness questionnaire (5 point Likert scale) post-intervention	At baseline no differences between OSCE scores of I and C Groups Both I & C Groups OSCE scores ↑post intervention; I Group had higher OSCE scores post-intervention (p< 0.05) No differences in confidence or stressfulness scores of I & C Groups post-intervention	Weak
Ballie & Curzio 2009 UK	Survey Convenience sample *n* =447 1st Year nursing students (79% response rate) Single site study	Questionnaire (including 2 open-ended questions)	Students +ve with simulated learning environment, resources, level of supervision & programme relevance Students –ve with time available to rehearse BP skill & lack of staff motivation in the clinical area	Moderate

Barry et al. 2012 Ireand	Qualitative study Purposive sample *n* =26 midwifery students (72% response rate) Single site study	Focus group interviews (interview guide used)	Qualitative data identified three themes; Preparation for OSCEs (lecture-led theory, workshops, individual preparation & practice in the CSL); OSCE process (performance, time frame); learning through simulating practice (confidence for placement)	Moderate
Bloomfield et al. 2010 UK	RCT Convenience sample n =242 nursing students (95.4% response rate; random allocation to I & C groups at baseline data collection) I *n* =118; C *n* =113 at baseline; I *n* =107; C *n* =116 immediate follow-up; I *n* =81; C *n*=83 2 weeks post-intervention; I *n*=44; C *n*= 42 8 weeks post-intervention. Intervention = CAL Single site study	Participant questionnaire at baseline Hand washing knowledge test at baseline, post-intervention, 2 weeks post-intervention & 8 weeks post-intervention Hand washing skills test at baseline, post-intervention, 2 weeks post-intervention & 8 weeks post-intervention	No differences in hand washing knowledge scores of I & C Groups at baseline, post-intervention, 2 weeks post-intervention & 8 weeks post-intervention (p=0.136) No differences in hand washing skills of I & C Groups at baseline, post-intervention & 2 weeks post-intervention. ↑ level of skill performance of I & C Group at 8 weeks post-intervention. ↑ in scores for I group at 8 weeks post-intervention (p =0.024)	Moderate
Brosnan et al. 2006 Ireland	Mixed methods Stage 1: purposive sample *n*=20 1st Year & 2nd Year nursing students & *n*=8 nursing lecturers Stage 2:purposive sample *n*=89 1st Year & 2nd Year nursing students (81% response rate) Single site study	Stage 1 Focus group interviews Stage 2 Questionnaire (61-item closed questions and 2-item open questions)	Qualitative data +ve about OSCE as a method of assessment, preparation for practice &↑confidence Qualitative data –ve about stress. Stress levels ↑prior to OSCE and waiting for feedback (p=0.001) Psychiatric students ↓ stressed with OSCE process (p=0.04). Older students ↑ OSCE scores (p<0.001) & ↑prepared for placement following OSCE (p=0.019)	Moderate

Byrne & Smyth 2007 Ireland	Qualitative study Purposive sample *n*=11 nurse educators Single site study	Focus groups using semi-structured approach	Findings identified 2 main themes: OSCE preparation & assessment process OSCE preparation included skill mix & preparation of students, nurse educators and environment. Assessment process included trial run, duration & reflective time	Weak
DeBourgh & Prion 2010 USA	Quasi-experiment Convenience sample *n*=264 junior nursing students (89.8% response rate) Intervention = simulator experience Single site study	Risk and harm reduction knowledge (10-item questionnaire) at baseline & post-intervention Online survey (4 open-ended questions) post-intervention (students and instructors) and end of semester (students and instructors)	Scores ↑post-intervention ($p<0.01$) Qualitative data were +ve about intervention re. knowledge & skill learning. Clinical instructors +ve re intervention	Moderate
Fraser et al. 2009 Canada	Quasi-experiment Convenience sample *n*=146 1st Year medical students in (no attrition reported) I (1) chest pain *n*=73; I (2) dyspnoea *n*=73. I = cardio-respiratory simulators (CRS) Single study site.	Skill performance (scale 0-3) at post-intervention Skill retention (Scenarios and - item MCQ) at post-intervention & 6 weeks Knowledge on chest pain and dyspnoea (6-item MCQ) at post-intervention & 6 weeks	Students better in identifying abnormal clinical findings post-intervention ($p<0.0001$) & at 6 weeks ($p=0.004$) and had ↑diagnostic performance post-intervention ($p<0.0007$) & at 6 weeks ($p=0.002$) Students had poor transfer of skills to different problems in the CRS ($p=0.5$) & knowledge of chest pain and dyspnoea (MCQ items) ($p=0.8$) at 6 weeks Training on CRS had no effect on performance of knowledge of chest pain and dyspnoea (MCQ items) ($p=0.8$)	Weak
Freeth & Fry 2005 UK	Survey Purposive sampling *n*=254 (n = 224 1st , 2nd & 3rd Year nursing students (response rate 89%); *n*=30 tutors (response rate 63%)) Single study site	Questionnaire survey (58-item five point Likert scale) of nursing students and tutors' perceptions (37-item) of learning and teaching.	+ve experience of learning in CSC for students and tutors Junior students (year 1) identified CSC for practice of skills to develop expertise & confidence ($p<0.001$); linking theory to practice ($p<0.001$) & transferring skills from CSC to practice ($p<0.01$). Senior students (year 2,3) more subdued in response Qualitative data from tutors +ve about use of mannequins, clinical equipment, CSC resources & student motivation; -ve about equipment not set up & out of date equipment	Moderate

Grant el al. 2009 USA	Quasi-experiment Convenience sample n = 40 senior nursing students and anaesthetic nursing students (100% response rate; random allocation to I & C Groups) I Group *n*=20; C Group *n*=20 Intervention = video-facilitated debriefing Single site study	Modified observational clinical simulation tool (score range 0- 31 scenario 1; score range 0 -34 scenario 2)	No differences between I and C Groups for total performance scores by simulation scenario I Group ↑performance in patient identification ($p<0.01$); team communication ($p =0.013$) & assessment of vital signs ($p =0.047$) I Group v+ about intervention	Weak
Gustafsson & Feberberg 2003 Sweden	Phenomenological study Purposive sample *n* =4 registered nurses 2 study sites	Semi-structured interviews	Reflection was identified as a conscious activity that can take place before, during or after a nursing situation Three categories identified included: 1) to reflect (sub categories: think back, mirroring, to reflect before and after & to use experience); 2) content of RNs reflections (sub categories: ethical considerations, to have courage, to use imagination & empathy) & 3) consequences (sub categories: to meet the unique, empathy & development)	Moderate
Hatelivik 2011 Norway	Survey Secondary data analysis *n*= 446 3rd Year nursing students (71% response rate) National database	Survey questionnaire (originally 231-item; 7-item reported for this study Likert scale 1-5)	Women ↑ability to reflect on and critically assess their own work ($p>0.05$) The acquired reflective skills of students are connected to practical skills and theoretical knowledge The perception of coherence between the theoretical and practical elements of initial nursing education is influenced by the perception of acquired reflective skills and theoretical knowledge of the students	Moderate
Houghton et al. 2012 Ireland	Qualitative multiple case study design. Purposive sampling *n*= 58 (*n*= 15 academic staff, *n*=15 clinical staff, *n*=8 newly qualified staff & *n*=20 undergraduate nursing students) 5 case study sites	Semi-structured interviews	5 key themes reported for use of CSL: teaching approaches (use of mannequins, real people & scenario-based); assessment approaches (OSCE); pathway to practice (linking theory to practice; relationship between HEI and clinical practice) & authenticity of CSL	Weak

Jeffries 2001 USA	Experiment Convenience sample *n* =49 junior nursing students (72.4% response rate) Random allocation I *n*=25; C *n*=24 at baseline I *n*=19; C *n*=23 post-intervention I(1)= learner-controlled interactive multi-media CD-ROM; I(2) teacher-controlled lectures, overhead transparencies & videotape Single site study	Skills knowledge test (40-item scale) at baseline, post-intervention & 1 week Skill competency (procedural checklist) at 1 week post-intervention Student satisfaction scale (11-item scale) post-intervention Learning time differences (minute counting)	At baseline no differences between education & computer skills of I and C Groups ($p<0.05$) I & C Groups knowledge scores ↑post-intervention; I Group had higher knowledge scores post-intervention ($p=0.01$) Post-intervention no differences between competency in administering oral medications of I & C Groups I Group completed task in a shorter time frame post-intervention I & C Groups were +ve with methods of teaching; I Group had higher satisfaction with intervention ($p=0.01$)	Weak
Jeffries et al. 2003 USA	Quasi-experiment Convenience sample *n* =77 senior nursing students on a critical care course (94% response rate) Random allocation (by group) I *n*=45; C *n*= 32 at baseline I = interactive multi-media CD ROM Single site study	Cognitive gains questionnaire (27 - item MCQ) at baseline and post-intervention Satisfaction questionnaire (5-item subscale); self-efficacy questionnaire (8-item subscale) & assessor rated (22-item skills competency checklist) post-intervention	At baseline no differences in pre-test knowledge scores of I & C Groups ($p<0.05$) I & C Group knowledge scores ↑post-intervention ($p<0.0001$); no significant differences on pre-test, post-test or improvement scores for I & C Groups No differences in cognitive gains, skills performance or satisfaction with learning method between I & C Groups post-intervention	Weak

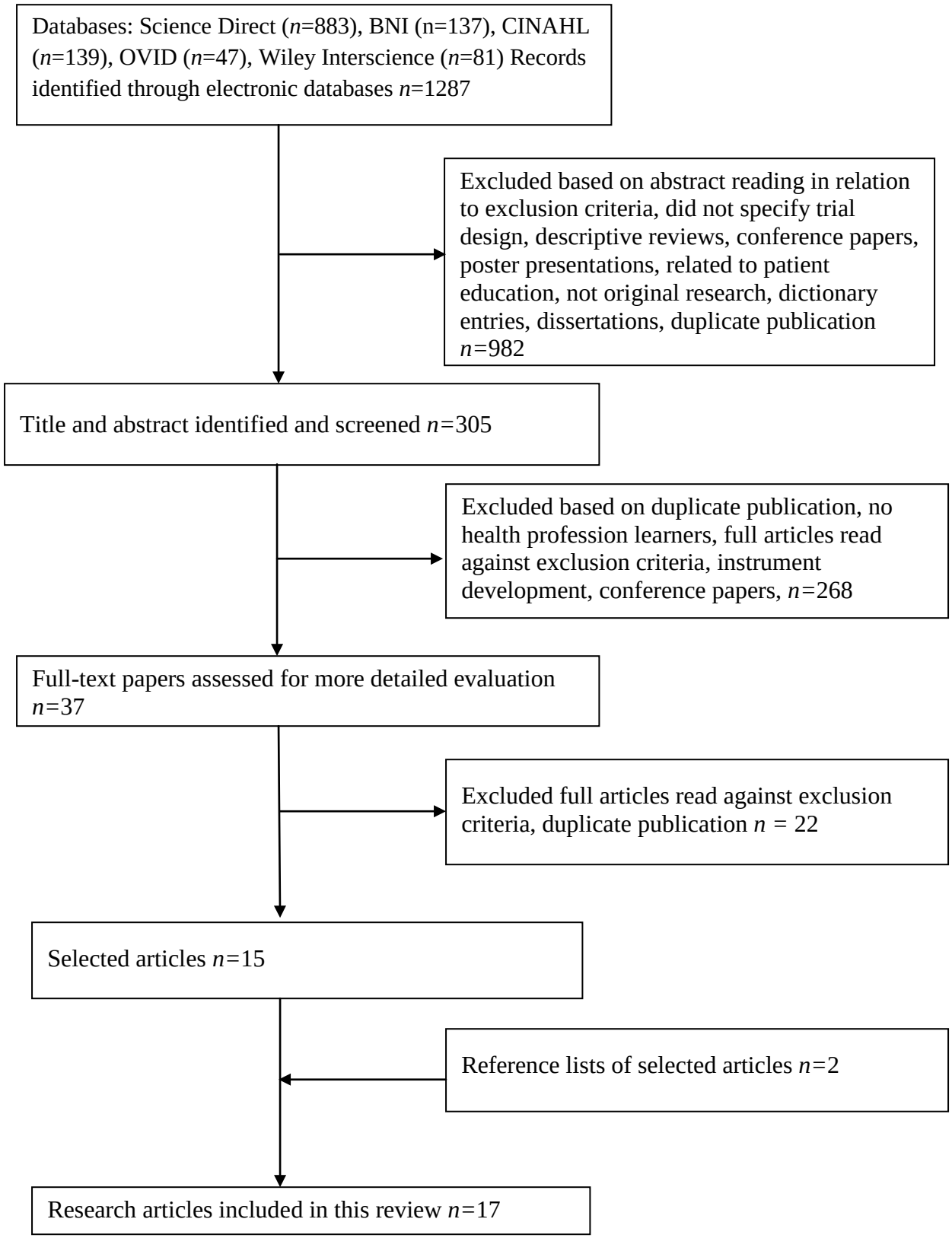
Kelly et al. 2008 Ireland	Quasi-experiment Convenience sample *n* =204 nursing students (Response rate 6.8% for outcomes evaluation part of study; response rate 65.6% for questionnaire; random allocation to I & C Groups at baseline data collection) I *n*=7 ; C *n*=7 at baseline I *n*= 6; C *n*= 4 at 1 week Intervention = online learning videos Single site study	Attitude and innovation questionnaire (16-item Likert scale, 2 open-ended questions) OSCE post intervention (I & C Group) Knowledge and performance test (15-item MCQ) (I & C Group) post-intervention	No differences in skills and MCQ results between I & C groups post-intervention I Group ↑ uptake of watching of skills videos (60.6%) and females demonstrating ↑preference than males (p=0.003) Mature students (over 23 years) were +ve with flexibility of learning through use of DVDs	Weak
Kneebone et al. 2002 UK	Qualitative study Purposive sample *n* =51 2nd &3rd Year medical students (no attrition rate reported) Single site study	Observation; video assessment; semi-structured interviews	Use of realistic scenarios & timely feedback ↑student learning & satisfaction Tutors +ve about use of scenarios & SPs. ↑opportunity to integrate technical & communication skills within a safe environment	Weak
Kurz et al. 2008 USA	Quasi-experiment Purposive sample *n* =37 graduate nursing students (100% response rate; random allocation to I & C Groups) I Group *n* =26; C Group *n*=11 Intervention = SP & OSCE Single site study	Competency checklist at OSCE (20-item); course evaluation by students (7-item 5 point Likert scale); evaluation by preceptors (20-item 5 point Likert scale) & self-evaluation survey (24-item 4 point Likert scale)	Post-intervention no differences between I and C Groups for mean practical examination score (p>0.05) I Group↑ preceptor evaluation scores (p=0.01); I Group ↑ self-evaluation scores (Part 1 & 2) (p=0.01) I Group ↑ satisfaction with quality of course materials (p<0.02), information technology (p<0.01) & their learning (p<0.01)	Weak

Madden 2006 Ireland	Experiment Cohort study *n* =55 second 1st Year nursing students (*n*=18 students accepted for inclusion; random selection; no attrition reported) Single site study	CPR cognitive knowledge (21-item MCQ) and CPR psychomotor skills (scoring system based on observation & Laerdal skill meter) at baseline, post-intervention & at 10 weeks post-intervention	Acquisition in nurses' CPR knowledge ↑following a 4-hours training programme (p=0.001). 25% of students did not meet the pass standard 10 weeks post-intervention ↓CPR knowledge (p=0.004) CPR psychomotor skills ↑following a 4-hours training programme (p=0.001) 10 weeks post-intervention ↓CPR psychomotor skills (p=0.001) The pass standard in the pre-test, post-test or re-test not achieved by any student	Weak
Morgan et al. 2006 Canada	Experiment Purposive sample *n* =299 final year medical students (81% response rate) intervention = simulation & video-tapes Single site study	Performance checklists (global rating scale 1-5; pre-determined checklists) MCQs (10 questions) pre-test & post-test; educational evaluation	At baseline no difference in pharmacology scores (p=0.032) ↑ pharmacology scores post-intervention (p<0.0001) ↑simulator team performance scores post-intervention (p<0.0001) Students +ve about simulation experience	Moderate
Oermann et al. 2011 USA	RCT Convenience sample *n* =606 1st Year nursing students (83.3% response rate; random allocation to I & C Groups at baseline data collection; random sample at 3,6,9,12 months) I Group *n* =303; C Group *n*=303 at baseline (Attrition rates varied at different time points) Intervention = monthly	Assessment of psychomotor skills (Laerdal Resusci Anne Skill ReporterTM manikin) at baseline, 3months (random sample), 6 months (random sample), 9 months (random sample), 12 months (random sample) & 12 months + repeated BLS course (random sample).	No differences at baseline and at 3months for I & C Groups for compression rate & depth (p=0.09) & ventilation rate (p=0.09). No differences in hand placement for I & C Groups at baseline,3,6, 9,& 12 months post-intervention (p=0.32) I Group compression depth skill was within accepted range at 6, 9 & 12 months post-intervention (p = 0.002). C Group compression depth skill ↓ at 6, 9 & 12 months post-intervention (p=0.004) I Group compression rate ↑ at 12 months post-intervention (p=0.02). C Group compression rate ↓at 9 months & 12	High

	repeated practice, verbal feedback & prompts 10 study sites		months post-intervention (p=0.05) I Group ventilation volume ↑ at 6, 9 & 12 months post-intervention (p<0.001). C Group ventilation volume ↓at 6,9, & 12 months post-intervention (p=0.004) I Group maintained or ↑CPR skills scores at 12 months post-intervention	
Radhakrishnan et al. 2007 USA	Quasi-experiment Cohort study n = 35 senior nursing students (*n*=12 students accepted for inclusion; no attrition reported). Random allocation to I & C groups at baseline I *n*=6; C *n*=6 Intervention = simulation Single site study	Clinical Simulation Evaluation Tool (CSET) (5-item and sub item scale) post-intervention Written case study (I group) post-intervention	I Group scores ↑for patient safety (p=0.0001) and ↑for basic assessment skills (p=0.0009) No differences in performance for focused assessment, interventions, delegation & communication (p>0.05) of I & C Groups post-intervention	Weak
Salyers 2007 USA	Quasi-experiment Cohort sample *n*=36 nursing students (100% response rate) I *n*=22; C n= 14 at baseline (not randomly assigned) Intervention = web-enhanced teaching Single site study	C Group; Cognitive unit examinations (25 – 30 MCQs) at baseline & post-intervention I & C Groups; Final cognitive examination (60-item); skill performance (pre-determined checklist) post-intervention I Group; Quiz (10-item) after each unit module I & C Groups satisfaction questionnaire (5 point Likert scale) post-intervention	I Group ↑ scores in cognitive examination post-intervention (p <0.01) No differences in psychomotor skills examination of I & C Groups post-intervention (p>0.05). I Group ↓ satisfaction with method of instruction (p<0.05)	Weak

Shepherd et al. 2007 Australia	Experiment Cohort study n = 74 graduate nurses (92.5% response rate) Random allocation to three education interventions at baseline Group 1 *n* =25 SDLP; Group 2 *n*=26 SDLP + PPT; Group 3 *n*=23 SDLP + simulation Intervention = simulation Four site study	Patient assessment knowledge test at baseline (12-item and sub-items) Clinical Response Verification Tool (Weighting system) post-intervention	At baseline no differences between the three groups re. knowledge scores ($p>0.76$) There was ↑in mean scores for students in SDLP + simulation ($p<0.001$) followed by SDLP and then SDLP + PPT post-intervention No differences between Group 1 (SDLP) and Group 2 (SDLP & PPT) post-intervention	Weak
Stayt & Merriman 2012 UK	Survey Convenience sample *n*=421 pre-registration nursing students (53% response rate) Single site study	On-line self-reporting questionnaire (16-item 5 point Likert scale & open-ended comments)	Varied opportunity to practice core clinical skills with different disciplines; varied levels of supervision for skills practice Senior nursing students ↑level of confidence & competence with core nursing skills Qualitative data +ve about mentor support & clinical placements. Qualitative data –ve about assessment of skills, feedback on performance & busy placements preventing skill development	Moderate
Strand et al. 2009 Norway	Survey Purposive sample *n* =224 nursing students from across 3 years (87.5% response rate) Single site study	Semi-structured questionnaire (5 open-ended questions) completed twice (autumn & spring)	No differences in patterns of learning across the 3 years. A pre-requisite for learning is a feeling of security Learning is complex and occurs through interactive teamwork, training, sensing / kinaesthetic involvement & positive teacher guidance	Moderate
Wellard et al. 2009 Norway	Qualitative multiple case study design Purposive sample *n*=13 nursing lecturers (*n*=8 site 1; *n*=5 site 2) 2 study sites	Individual and group interviews Observations during site visits	Qualitative data were +ve about the use of CSL for integration of learning, development of nursing practice, skills & confidence; ↑student motivation for learning in the CSL	Weak

Appendix 3 Stage 2 Literature search for learning styles

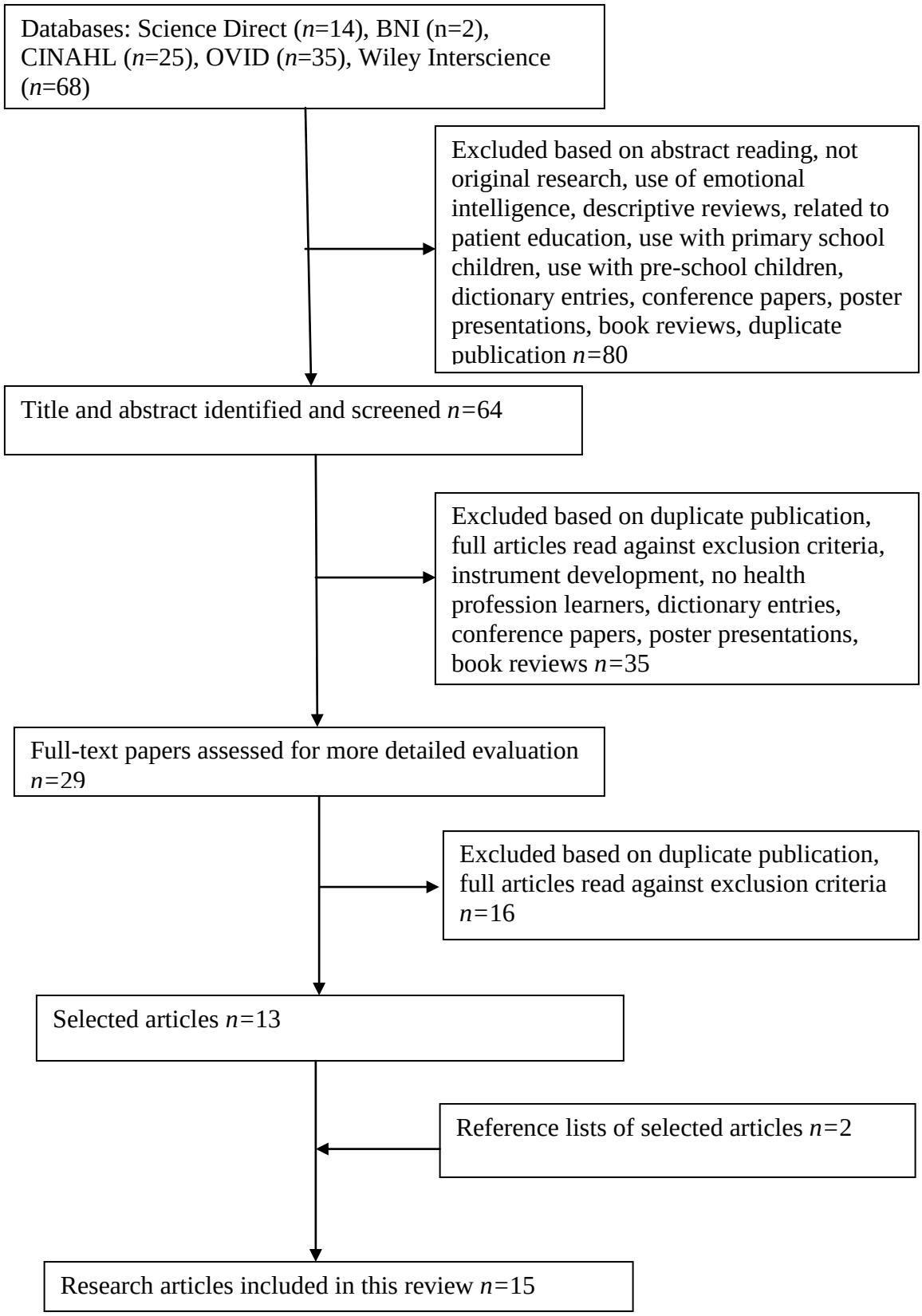


Appendix 4 Literature search terms: Psychomotor skill and learning styles preferences

Subject headings and free text terms used in literature search 2.

Element 1	**Element 2**
Psychomotor skills Motor skills Skills acquisition Skills performance Skill development Nursing procedure$ Clinical procedure$ Technical proficiency	Learning styles Learning styles preference$ Learning preference$ Student learning Learning strategy Active learning

Appendix 5 Stage 3 Literature search for multiple intelligences



Reference and location	Design and sample	Instruments and data collected	Key findings	Rating
Akkuzu & Akcay 2011 Turkey	Multiple methods Experiment & interview Cohort sample *n* =75 high school students (response rate 100%; random allocation to I & C Groups at baseline data collection) I Group *n*=38; C Group *n*=37 *n*=9 (random selection for interviews) Intervention = MI teaching strategy Single site study	Periodic Features' Variation Achievement Test (PFVAT) (33 MCQs) at pre-test, post-intervention & at 4 weeks; Chemistry attitude scale (23-item 5 point Likert scale); Semi-structured interview (4 open-ended questions)	At baseline no differences between I and C Groups in achievement test findings ($p>0.05$) ↑attitude scores for I Group post-intervention Qualitative data +ve about MI teaching approach and for constructing new knowledge	Weak
Özdermir et al. 2006 Turkey	Experiment Cohort sample *n*= 70 4th Grade students (response rate 100%; random allocation to I & C Groups at baseline data collection) I Group *n*=35; C Group *n* =35 Intervention = MI teaching strategy Single site study	Diversity of living things concept tests (25-item MCQs) at baseline & 2 months post-intervention; Teele inventory of multiple intelligences (56-item pictorial inventory) at baseline & post-intervention	At baseline no differences between I and C Groups re. understanding of diversity of living things ($p>0.05$) I Group had higher skills scores post-intervention and at 2 months post-intervention ($p<0.05$) I Group variation in intelligences scores post-intervention. I Group ↑musical intelligence, ↑spatial intelligence & ↑interpersonal intelligence post-intervention ($p<0.05$) C Group no changes in intelligences scores ($p>0.05$)	Weak

Appendix 6 Literature search terms: Psychomotor skill and Multiple Intelligences (MI).

Subject headings and free text terms used in literature search 3.

Element 1	**Element 2**
Psychomotor skills Motor skills Skills acquisition Skills performance Skill development Nursing procedure$ Clinical procedure$ Technical proficiency	Multiple intelligences Student learning Learning strategy Active learning Teaching strategy

Appendix 7 Inclusion / exclusion criteria used for primary literature search

Inclusion	Exclusion
The teaching and learning approaches used in clinical skills acquisition for nurse education	The teaching and learning approaches used in clinical skills acquisition for use in other health professional training and for patient education
Empirical studies that explored the learning and teaching of clinical skills using simulation on educational outcomes for nurses	Descriptive reports, Correlational survey design, review papers and literature reviews that evaluated the students' observations
Quasi-experimental or experimental approaches to the teaching and learning of clinical skills in a simulated environment	Studies that did not specify the trial design
Papers published between 1994 and 2011 (the introduction of Diploma programme in Ireland)	Paper published before 1994 (unless considered relevant)
Each study reported once	Duplicates of the same study
Papers published in the English language.	Papers published in a language other than English.

Appendix 8 Ethical Consent (Institutional)

Ref: 10/NUR/03

26th January, 2011.

Ms. Linda Sheahan,
Department of Nursing,
WIT.

Dear Linda,

Thank you for submitting your amended documentation in relation to your project *'To evaluate whether the combination of learning style and multiple intelligence in order to learn clinical skills using a multiple intelligences teaching approach (MITA) affects student results in OSCE achievement in an undergraduate nursing education programme'* to the WIT Research Ethics Committee.

I am pleased to inform you that we approve WIT's participation in this project and will convey this to Academic Council.

We wish you well in the work ahead.

Yours sincerely,

pp Suzanne Kiely
Dr. John Wells,
Chairperson,
Research Ethics Committee.

cc: Prof. Alison While, Department of Nursing & Midwifery, King's College
Dr. Jacqueline Bloomfield, Department of Nursing & Midwifery, King's College

Appendix 9 Consent Forms (Experimental and Control) and Research Information Sheet

Consent Form (Experimental Group)

Dear participant,
Many thanks for agreeing to take part in this study.

In signing this document, you understand that you will be part of a study that will explore multiple intelligence theory, learning styles and assessment preferences in the context of teaching and learning in clinical skills in undergraduate nurse education. You have read the attached research information sheets.

The results of this research will be submitted to King's College London as part of my doctoral study and with your permission may be published and/or shown to other academic educators/researchers. You will not be personally identified by name or description within the study or any publication nor identified to another third party. All information ascertained verbally or otherwise will be treated confidentially both during and after the research study. All information stored in paper format will be stored in a locked cabinet in my office to which only the researcher holds the key. Any information stored in electronic format will be password protected and only the researcher knows the password.

If you have any questions please contact me on 051 306170 (office number). When fully satisfied please fill in below.

I ---------- [print name] have read the above explanation of the research and will volunteer to participate. I understand that I will have my MIDAS profile taken on one occasion during this research and my learning style profile done on one occasion. I have had an opportunity to ask any questions about my participation, and all questions have been answered to my satisfaction. I recognize that my participation is voluntary and I may withdraw at any time. I give permission for information, given both at the interview and by

audiotape, to be recorded in written format [pseudonyms used]. Data will be protected in accordance with the Data Protection Act 2003.

I understand that all material [including results] will only be used for educational purposes by the researcher/educator and the participants in this research. Please find attached research information sheet.

This project is subject to ethical approval from the Ethics Committee WIT.

Participant Signature _____Date_____

Lecturer /Researcher Signature _____ Date_____

Research Information Sheet

Students also received information specific to MI, MITA and MIDAS.

I give permission to the School Secretary in the Department of Nursing, WIT, to furbish my examination results for January 2012 for the module Fundamental Nursing Skills and Experience 1 and May 2012 for the module Medication Management 1 to the researcher.

Please tick if you agree □

Consent Form (Control Group)

Dear participant,

Many thanks for agreeing to take part in this study.

In signing this document, you understand that you will be part of a study that will explore multiple intelligence theory, learning styles and assessment preferences in the context of teaching and learning in clinical skills in undergraduate nurse education. You have read the attached research information sheets.

The results of this research will be submitted to King's College London as part of the researcher's doctoral study and with your permission may be published and/or shown to other academic educators/researchers. You will not be personally identified by name or description within the study or any publication nor identified to another third party. All information ascertained verbally or otherwise will be treated confidentially both during and after the research study. All information stored in paper format will be stored in a locked cabinet in my office to which only the researcher holds the key. Any information stored in electronic format will be password protected and only the researcher knows the password.

If you have any questions please contact me on 051 306170 (office number). When fully satisfied please fill in below.

I ---------- [print name] have read the above explanation of the research and will volunteer to participate. I understand that I will have my MIDAS profile taken on one occasion during this research and my learning style profile done on one occasion. I have had an opportunity to ask any questions about my participation, and all questions have been answered to my satisfaction. I recognize that my participation is voluntary and I may withdraw at any time. I give permission for information, given both at the interview and by audiotape, to be recorded in written format [pseudonyms used]. Data will be protected in accordance with the Data Protection Act 2003.

I understand that all material [including results] will only be used for educational purposes by the researcher/educator and the participants in this research. Please find attached research information sheet.
This project is subject to ethical approval from the Ethics Committee WIT.

Participant Signature _____Date_____

Lecturer /Researcher Signature _____Date_____

Research Information Sheet

Students also received information specific to MI, MITA and MIDAS.

I give permission to the School Secretary in the Department of Nursing to furbish my examination results for January 2012 for the module Fundamental Nursing Skills and Experience 1 and May 2012 for the module Medication Management 1 to the researcher.

Please tick if you agree □

Participant information sheet

Title of study: An exploratory trial exploring the use of a multiple intelligences teaching approach (MITA) for teaching clinical skills to first year undergraduate nursing students

I would like to invite you to participate in a research project. You should only take part if you want to. Before you make a decision I would like you to read and understand the following information. If you want to speak to me at any time to ask any questions or you require any further information my contact details are available at the end of this information sheet.

Study details:

The teaching and learning of clinical skills is essential to your development as a nursing student. However, the best method of teaching clinical skills is not known. This study has been designed to test the effectiveness of a multiple intelligences teaching approach (MITA) for teaching clinical skills.

If you choose to participate you will be randomly allocated to one of two groups. If you are assigned to group 1 you will be taught skills with the teaching approach currently used in the department. If you are assigned to group 2 you will be taught skills using MITA. You should know that regardless of the group you are allocated to everyone will receive the same information and the method of assessment will be the same. This will be a practical examination at the end of the semester.

All participants will be asked to complete the Index of Learning Styles, the Multiple Intelligences Development Assessment Scale and a Multiple Intelligences Assessment Preferences questionnaire. For the purpose of this study you will be provided with a personal code that will be known only to you and the researcher. Any data collected on paper will be stored in a locked cabinet in the researcher's office. Any information collected electronically will be password protected. The findings from this study may be published in National or International journals. Your name will not be used in any data published.

It is your decision to take part or not take part in this study. If you do wish to take part you will be provided with a consent form that should be signed and returned to my office. You should know that you have the right to withdraw at any time without any consequences and your skills will continue to be taught.

Aim and objectives of the study:

The aim of this study is to measure the effectiveness of using a Multiple Intelligences Teaching Approach (MITA) in teaching clinical skills to first year undergraduate nursing students.

The research objectives are to:

1. Measure if teaching clinical skills using MITA affected end of semester OSCE results between experimental and control groups.
2. Identify if there was a relationship between learning styles preferences and MIDAS IS preferences.
3. Determine if there is a relationship between learning styles and MIDAS IS profiling and OSCE results between experimental and control groups.
4. Determine if there was a relationship between participants preferred method of MI assessment using the MI preferences assessment questionnaire and OSCE results.
5. Explore first year nursing students' experiences of the MITA approach to clinical skills teaching.

The Benefits/outcomes of this research are: -

- It is proposed that the research outcomes will raise awareness of learning style preferences and Multiple Intelligences approaches to teaching and learning in contemporary nurse education.
- Impart a more in-depth understanding of the relationship between teaching and learning.
- Provide greater opportunity for matching student learning styles preferences and Multiple Intelligences preferences with appropriate teaching approaches.
- Provide information about the efficacy of the tools used, in an Irish context, thereby providing opportunity for other departments of nursing and third level institutes of education to utilise these tools/approaches in enhancing learning and teaching.

Further information can be found

Gardner H. (1983) *Frames of Mind*. Harvard: University Press.
Brain Connections (2001) http:// www.brainconnection.com/topics
Project Zero http://www.pz.harvard.edu

If you require any further information or wish to discuss your participation in this study please contact **Linda Sheahan on 051 306170 or lsheahan@wit.ie.**

Appendix 10 OSCE criterion checklist (Sample)

Module: General Nursing Skills and Experience 1

AFFIX STUDENTS IDENTITY LABEL HERE

Lab number:

Examiners Name:

Handwashing

Greet the student and give him / her the written instructions.
Please tick the appropriate box beside each performance criteria.

Performance Criteria	Performed competently	Performed but not fully competent	Not performed or incompetent
1.Removes hand and wrist jewellery (wedding band allowed)			
2.Turns on taps and checks water temperature.			
3.Wets hands thoroughly under running water.			
4.Using elbow or heel of hand obtains liquid soap from wall dispenser.			
5.Forms a lather with liquid soap and commence washing hands.			
6.Rubs lather palm to palm 5 times			
7.Rubs right palm over the back of the left hand up to the wrist level 5 times and do the same with the other hand			
8.With right hand over left hand rubs interlaced fingers 5 times and do same with other hand			
9.Rubs palm to palm with the fingers interlaced 5 times			
10.Washes thumbs of each hand separately using a rotating movement 5 times			
11.Rubs the tips of the fingers against the opposite palm using a circular motion. Also ensure nail beds are washed 5 times			
12.Rinses hands thoroughly under running water to remove all traces of soap			
13.Turns off taps using elbows or paper towel. Student should avoid splashing clothes or floor.			
14. Dries hands thoroughly using a disposable paper towel			
15. Discards paper towel in waste bin ensuring that they open bin using foot pedal only to avoid contaminating clean hands.			
PASS: √		**FAIL:** ×	

This criteria-based checklist was developed by the module team in the college study took place for the first year OSCE.

Appendix 11 Instruments (ILS, MIDAS-IS, MI Assessment Preferences ILS questionnaire)

NC STATE UNIVERSITY

Index of Learning Styles Questionnaire Barbara A. Soloman
First-Year College
North Carolina State University
Raleigh, North Carolina 27695 Richard M. Felder
Department of Chemical Engineering
North Carolina State University
Raleigh, NC 27695-7905

Directions Please provide us with your full name. Your name will be printed on the information that is returned to you.

Full Name

For each of the 44 questions below select either "a" or "b" to indicate your answer. Please choose only one answer for each question. If both "a" and "b" seem to apply to you, choose the one that applies more frequently. When you are finished selecting answers to each question please select the submit button at the end of the form.

1. I understand something better after I
   - ● **(a)** try it out.
   - ● **(b)** think it through.
2. I would rather be considered
   - ● **(a)** realistic.
   - ● **(b)** innovative.
3. When I think about what I did yesterday, I am most likely to get
   - ● **(a)** a picture.
   - ● **(b)** words.
4. I tend to
   - ● **(a)** understand details of a subject but may be fuzzy about its overall structure.
   - ● **(b)** understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
   - ● **(a)** talk about it.
   - ● **(b)** think about it.
6. If I were a teacher, I would rather teach a course
   - ● **(a)** that deals with facts and real life situations.
   - ● **(b)** that deals with ideas and theories.
7. I prefer to get new information in
   - ● **(a)** pictures, diagrams, graphs, or maps.

- **(b)** written directions or verbal information.

8. Once I understand
   - **(a)** all the parts, I understand the whole thing.
   - **(b)** the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
   - **(a)** jump in and contribute ideas.
   - **(b)** sit back and listen.
10. I find it easier
    - **(a)** to learn facts.
    - **(b)** to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
    - **(a)** look over the pictures and charts carefully.
    - **(b)** focus on the written text.
12. When I solve math problems
    - **(a)** I usually work my way to the solutions one step at a time.
    - **(b)** I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
    - **(a)** I have usually gotten to know many of the students.
    - **(b)** I have rarely gotten to know many of the students.
14. In reading nonfiction, I prefer
    - **(a)** something that teaches me new facts or tells me how to do something.
    - **(b)** something that gives me new ideas to think about.
15. I like teachers
    - **(a)** who put a lot of diagrams on the board.
    - **(b)** who spend a lot of time explaining.
16. When I'm analyzing a story or a novel
    - **(a)** I think of the incidents and try to put them together to figure out the themes.
    - **(b)** I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
    - **(a)** start working on the solution immediately.
    - **(b)** try to fully understand the problem first.
18. I prefer the idea of
    - **(a)** certainty.
    - **(b)** theory.
19. I remember best
    - **(a)** what I see.

- **(b)** what I hear.

20. It is more important to me that an instructor
    - **(a)** lay out the material in clear sequential steps.
    - **(b)** give me an overall picture and relate the material to other subjects.
21. I prefer to study
    - **(a)** in a study group.
    - **(b)** alone.
22. I am more likely to be considered
    - **(a)** careful about the details of my work.
    - **(b)** creative about how to do my work.
23. When I get directions to a new place, I prefer
    - **(a)** a map.
    - **(b)** written instructions.
24. I learn
    - **(a)** at a fairly regular pace. If I study hard, I'll "get it."
    - **(b)** in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
    - **(a)** try things out.
    - **(b)** think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
    - **(a)** clearly say what they mean.
    - **(b)** say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
    - **(a)** the picture.
    - **(b)** what the instructor said about it.
28. When considering a body of information, I am more likely to
    - **(a)** focus on details and miss the big picture.
    - **(b)** try to understand the big picture before getting into the details.
29. I more easily remember
    - **(a)** something I have done.
    - **(b)** something I have thought a lot about.
30. When I have to perform a task, I prefer to
    - **(a)** master one way of doing it.
    - **(b)** come up with new ways of doing it.
31. When someone is showing me data, I prefer
    - **(a)** charts or graphs.
    - **(b)** text summarizing the results.
32. When writing a paper, I am more likely to

- **(a)** work on (think about or write) the beginning of the paper and progress forward.
- **(b)** work on (think about or write) different parts of the paper and then order them.

33. When I have to work on a group project, I first want to
    - **(a)** have "group brainstorming" where everyone contributes ideas.
    - **(b)** brainstorm individually and then come together as a group to compare ideas.
34. I consider it higher praise to call someone
    - **(a)** sensible.
    - **(b)** imaginative.
35. When I meet people at a party, I am more likely to remember
    - **(a)** what they looked like.
    - **(b)** what they said about themselves.
36. When I am learning a new subject, I prefer to
    - **(a)** stay focused on that subject, learning as much about it as I can.
    - **(b)** try to make connections between that subject and related subjects.
37. I am more likely to be considered
    - **(a)** outgoing.
    - **(b)** reserved.
38. I prefer courses that emphasize
    - **(a)** concrete material (facts, data).
    - **(b)** abstract material (concepts, theories).
39. For entertainment, I would rather
    - **(a)** watch television.
    - **(b)** read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
    - **(a)** somewhat helpful to me.
    - **(b)** very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
    - **(a)** appeals to me.
    - **(b)** does not appeal to me.
42. When I am doing long calculations,
    - **(a)** I tend to repeat all my steps and check my work carefully.
    - **(b)** I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
    - **(a)** easily and fairly accurately.
    - **(b)** with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
    - **(a)** think of the steps in the solution process.

- **(b)** think of possible consequences or applications of the solution in a wide range of areas.

When you have completed filling out the above form please click on the Submit button below. Your results will be returned to you. If you are not satisified with your answers above please click on Reset to clear the form.

Submit Reset

MIDAS- INSTRUCTIONS

These questions take about 35 minutes to answer. There are 8 areas of activities, skills and interests covered. Think of this as if you are interviewing yourself. You may be surprised by what you know about yourself when you think carefully.

For questions that give you several choices, pick the one activity you're strongest in and rate yourself on that only. It is important that you give *honest* responses. Be fair to yourself.

Do not under rate what you are able to do.

You do not have to answer or guess at every question because each one has an **"I don't know"** or **"Does not apply"** choice. Use this answer whenever it fits best for you. For example, some of the questions may ask about things you may not remember or you never got to do.

1. Can you sing 'in tune'?	If **"D"** is your choice, then darken this **'BOX'**:										
		A	B	C	D	E	F	G	H	I	J
A = A little bit	3	1	2	3	4	5	6	7	8	9	0
B = Fair											
C = Well		A	B	C	D	E	F	G	H	I	J
D = Very well	1	1	2	3	4	5	6	7	8	9	0
E = Excellent											
F = I don't know											

- Darken one 'square' only for each questions **with a pencil.**
  The circles G, H, I and J are not used.

- Please **do not write** on the answer sheet or questionnaire.
- Erase all changes **completely.**
  Your profile will only be as accurate as your answers.

  It's o.k. to respond that you do not know.

MUSICAL

1. As a child, did you have a strong liking for music or music classes?
A = A little.
B = Sometimes
C = Usually
D = Often
E = All the time
F = I don't know

2. Did you ever learn to play an instrument?
A = No
B = A little
C = Fair
D = Good
E = Excellent
F = I don't know

3. Can you sing 'in tune'?
A = A little bit
B = Fair
C = Well
D = Very well
E = Excellent
F = I don't know

4. Do you have a good voice for singing with other people in harmony?
A = A little bit
B = Fair
C = Good
D = Very good
E = Excellent
F = I don't know

5. As an adult, did you ever play an instrument, play with a band or sing with a group?
A = Never
B = Every once in a while
C = Sometimes
D = Often
E = Almost all of the time
F = I don't know. Does not apply.

6. Do you spend a lot of time listening to music?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

8. Do you ever drum your fingers, whistle or sing to yourself?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

9. Do you often have favourite tunes on your mind?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

10. Do you often like to talk about music?
A = Never
B = Every once in a while
C = Sometimes
D = Often
E = Nearly all the time
F = I don't know

11. Do you have a good sense of rhythm?
A = Fair
B = Pretty good
C = Good
D = Very good
E = Excellent
F = I don't know

12. Do you have a strong liking for the SOUND of certain instruments or musical groups?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

13. Do you think you have a lot of musical talent or skill that was never fully brought out?
A = No
B = Some
C = A fair amount
D = A good amount
E = A great deal
F = I don't know.

7. Do you ever make up songs or write music?
A = Never
B = Once or twice
C = Every once in a while
D = Sometimes
E = Often
F = I don't know

14. Do you often have music on while you work, study or relax?
A = Every once in a while
B = Sometimes
C = Usually
D = Almost always
E = Always
F = I don't know

KINESTHETIC

15. In school, did you generally enjoy sports or gym class more than other school classes?
A = Not at all
B = A little
C = About the same
D = Enjoyed sports more
E = Enjoyed sports much more
F = I don't know

16. As a teenager, how often did you play sports or other physical activities?
A = Every once in a while
B = Sometimes
C = Often
D = Almost always
E = All the time
F = I don't know or does not apply

17. Did you ever perform in a school play or take lessons in acting or dancing?
A = Never
B = Maybe once
C = A couple of times
D = Often
E = Almost all the time
F = I don't know

18. Do you or other people (like a coach) think that you are co-ordinated, graceful or a good athlete?
A = No
B = Maybe a little
C = About average
D = Better than average
E = Superior
F = I don't know

22. Are you good with your hands at things like card shuffling, magic tricks or juggling?
A = Not very good
B = Fair
C = Good
D = Very good
E = Excellent
F = I don't know

23. Are you good at doing precise work with your hands such as sewing, making models, tying flies, typing or have good handwriting?
A = Not at all
B = Fairly good
C = Good
D = Very good
E = Excellent
F = I don't know

24. Do you enjoy working with your hands on projects such as mechanics, building things, preparing fancy food or sculptures?
A = Never or rarely
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know or doesn't apply

25. Are you good at using your body or face to imitate people such as teachers, friends or family?
A = Not at all
B = A little bit
C = Fair
D = Good
E = Very good
F = I don't know

19. Did you ever take lessons or have someone teach you a sport such as bowling, karate, golf, etc.?
A = No
B = Rarely
C = Sometimes
D = Often
E = Nearly all the time
F = I don't know

20. Have you ever joined teams to play a sport?
A = Never
B = Rarely
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

21. As an adult, do you often do physical work or exercise?
A = Rarely
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know. Does not apply

26. Are you a good dancer, cheerleader or gymnast?
A = Not at all
B = Fairly good
C = Good
D = Very good
E = Excellent
F = I don't know.

27. Do you learn better by having something explained to you or by doing it yourself?
A = Always better by explanation
B = Sometimes better by explanation
C = No difference
D = Usually better by doing it
E = Always better by doing it
F = I don't know

LOGICAL MATHEMATICAL

28. As a child, did you easily learn math such as addition, multiplication and fractions?
A = Not at all
B = It was fairly hard
C = Pretty easy
D = Very easy
E = Learned much quicker than all the kids
F = I don't know

29. In school, did you ever have extra interest or skill in math?
A = Very little or none
B = Maybe a little
C = Some
D = More than average
E = A lot
F = I don't know

30. How did you do in advanced math classes such as algebra or calculus?
A = Didn't take any
B = Not very well
C = Fair (C's)
D = Well (B's)
E = Excellent (A's)
F = I don't know or does not apply

37. How are you at figuring numbers in your head?
A = Cannot do it
B = Not very good
C = Fair
D = Good
E = Excellent
F = I don't know

38. Are you a curious person who likes to figure out WHY or HOW things work?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

39. Are you good at inventing 'systems' for solving lor or complicated problems? For example, betting at the race track or organising your home or life?
A = Not good at all
B = Fair
C = Good
D = Better than average
E = Excellent
F = I don't know

31. Have you ever had interest in studying science or solving scientific problems?
A = No
B = A little
C = Average
D = More than average
E = A great deal
F = I don't know

32. Are you good at playing chess or checkers?
A = No
B = Fairly good
C = Good
D = Very good
E = Excellent
F = I don't know

33. Are you good at playing cards or solving strategy or puzzle-type games?
A = Not at all
B = A little
C = About average
D = Better than average
E = Excellent
F = I don't know

34. Do you often play games such as Scrabble or crossword puzzles
A = Very rarely or never
B = Every once in a while
C = Sometimes
D = Often
E = All the time
F = I don't know

35. Do you have a good system for balancing a chequebook or figuring a budget?
A = Not at all
B = Fairly good
C = Good
D = Very good
E = An excellent system
F = I don't know or does not apply.

36. Do you have a good memory for numbers such as telephone numbers or addresses?
A = Not very good
B = Fair
C = Good
D = Very good
E = Superior
F = I don't know

40. Are you curious about nature like fish, animals, plants or the stars and planets?
A = Rarely
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

41. Have you ever liked to collect things and learn all there is to know about a certain subject such as antiques, horses, baseball, etc.
A = Not at all
B = A little
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

42. Are you good at jobs or projects where you have to use math a lot or get things organised?
A = Not good at all
B = Fairly good
C = Good
D = Very good
E = Excellent
F = I don't know or does not apply

43. Outside of school, have you ever enjoyed working with numbers like figuring baseball averages, gas mileage, budgets, etc.?
A = Not at all
B = Every once in a while
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

44. Do you use good common sense for planning social activities, making home repairs or solving mechanical problems?
A = Sometimes
B = Usually
C = Often
D = Almost all the time
E = All the time
F = I don't know

SPATIAL

45. As a child, did you often build things out of blocks or boxes; play with jacks, marbles or jump rope?

A = Never or rarely
B = Sometimes
C = Often
D = All the time
E = I don't know

46. As a teenager or adult, how well could you do any of these: mechanical drawing, hairstyling, woodworking, art projects, auto body or mechanics?

A = Didn't take any
B = Fair
C = Good (C's)
D = Very good (B's)
E = Excellent (A's)
F = I don't know. Does not apply.

47. How well can you 'design' things such as arranging decorating rooms, craft projects, building furniture or machines?

A = Never do
B = Fair
C = Pretty good
D = Good
E = Excellent
F = I don't know

48. **Can you parallel park a car on your first try?**

A = Rarely or do not drive
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know. Does not apply

49. Are you good at finding your way around new buildings or city streets?

A = Not at all
B = Fairly good
C = Good
D = Very good
E = Excellent
F = I don't know

50. Are you good at using a road map to find your way around?

A = Not at all
B = Fairly good
C = Good at it
D = Very good
E = Excellent at reading maps
F = I don't know

51. Are you good at fixing 'things' like cars, lamps, furniture or machines?

A = Not at all
B = Not very good
C = Fair
D = Good
E = Excellent
F = I don't know

52. How easily can you put things together like toys, puzzles or electronic equipment?

A = Not at all
B = It is hard
C = It is fairly easy
D = It is easy
E = It is very easy
F = I don't know

53. Have you ever made plans or patterns for projects such as sewing, carpentry, crafts, woodworking, etc.?

A = Never
B = Maybe once
C = Every once in a while
D = Sometime
E = Often
F = I don't know

54. Have you ever drawn or painted pictures?

A = Rarely or never
B = Every once in a while
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

55. Do you have a good sense of design for decorating, landscaping or working with flowers?

A = Not very good
B = Fair
C = Good
D = Very good
E = Excellent
F = I don't know

56. **Do you have a good sense of direction when in a strange place?**

A = Not at all
B = Fairly good
C = Good
D = Very good
E = Superior
F = I don't know

57. Are you good at playing pool, darts, riflery, archery, bowling, etc.?

A = Not at all
B = A little
C = Fair
D = Better than average
E = Excellent
F = I don't know

58. Do you often draw a picture or sketch to give directions or explain an idea?

A = Never
B = Rarely
C = Sometimes
D = Often
E = All the time
F = I don't know

59. Are you creative and like to invent or experiment with unique designs, clothes or projects?

A = Very little or not at all
B = A little
C = Somewhat
D = Often
E = Almost all the time
F = I don't know

LINGUISTIC

60. Do you enjoy telling stories or talking about favourite movies or books?
A = Not at all
B = Rarely
C = Sometimes
D = Often
E = Almost all the time
F = I'm not sure

61. Do you ever play with the sounds of wordslike making up jingles or rhymes? For example, do you gi things or people funny sounding nicknames?
A = Never
B = Rarely
C = Sometimes
D = Often
E = All the time
F = I don't know

62. Do you use colourful words or phrases when talking?
A = No
B = Rarely
C = Sometimes
D = Often
E = All the time
F = I don't know

63. Have you ever written a story, poetry or words to songs?
A = Never
B = Maybe once or twice
C = Occasionally
D = Often
E = Almost all of the time
F = I don't know

64. Are you a convincing speaker?
A = Not at all
B = Every once in a while
C = Sometimes
D = Often
E = Almost all of the time

65. How are you at bargaining or making a deal with people?
A = Not very good
B = Fair
C = Pretty good
D = Good
E = Excellent
F = I don't know

72. Are you often the one asked to 'do the talking' by family or friends because you are good at it?
A = Very rarely or never
B = Rarely
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

73. Have you ever been good at imitating the way other people talk?
A = Not really
B = Fairly good
C = Pretty good
D = Good
E = Very good
F = I don't know

74. Have you ever been good at writing reports for school or work?
A = Not really. Never do any
B = Pretty good
C = Good
D = Very good
E = Superior
F = I don't know

75. Can you write a good letter?
A = No or fair
B = Pretty good
C = Good
D = Very good
E = Excellent
F = I don't know

76. Do you like to read or do well in English classes?
A = A little
B = Sometimes
C = Usually
D = Often
E = All the time
F = I don't know

77. Do you write notes or make lists as reminders of things to do?
A = Rarely or never
B = Every once in a while
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

78. Do you have a large vocabulary?
A = Not really
B = Less than average
C = About average
D = Above average
E = Superior
F = I don't know

66. Can you talk people into doing things your way when you want to?
A = Not at all
B = Every once in a while
C = Sometimes
D = Often
E = Almost all the time
F = I'm not sure

67. Do you ever do public speaking or give talks to groups?
A = Very rarely or never
B = Every once in a while
C = Sometimes
D = Often
E = Almost all the time
F = I don't know

68. How are you at managing or supervising people?
A = Never do or not very good at all
B = Fair
C = Good
D = Very
E = Excellent
F = I don't know or doesn't apply

69. Do you have interest for talking about things like the news, family matters, religion or sports, etc.?
A = A little
B = Some interest
C = Average interest
D = More than average
E = A great deal
F = I don't know

70. When others disagree are you able to easily say what you think or feel?
A = Rarely
B = Every once in a while
C = Sometimes
D = Often
E = All the time
F = I don't know

71. Do you enjoy looking up words in dictionaries, or arguing with others about 'the right word' to use?
A = Never or rarely
B = Every once in a while
C = Sometimes
D = Often
E = Very often
F = I don't know

79. Do you have skill for choosing the right words and speaking clearly?
A = Not at all or rarely
B = Sometimes
C = Usually
D = Most of the time
E = Almost always
F = I don't know

INTERPERSONAL

80. Have you had friendships that have lasted for a long time?
A = One or two
B = More than a couple
C = Quite a few
D – A lot
E = A great many long lasting friendships
F = I don't know

81. Are you good at making peace at home, at work or among friends?
A = Fair
B = Pretty good
C = Good
D = Very good
E = Excellent
F = I don't know

82. Are you ever a 'leader' for doing things at school, among friends or at work?
A = Rarely
B = Every once in a while
C = Sometimes
D = Often
E = Almost always
F = I don't know

83. In school, were you usually part of a particular group or crowd?
A = Rarely
B = Every once in a while
C = Sometimes
D = Most of the time
E = Almost all the time
F = I don't know

84. Do you easily understand the feelings, wishes or needs of other people?
A = Sometimes
B = Usually
C = Often
D = Almost always
E = Always
F = I don't know

85. Do you ever offer to 'help' other people such as the sick, the elderly or friends?
A = Sometimes
B = Usually
C = Often
D = Very often
E = Always
F = I don't know

86. Do friends or family members ever come to you to talk over personal troubles or to ask for advice?
A = Every once in a while
B = Sometimes
C = Often
D = Almost all the time
E = All the time
F = I don't know

87. Are you a good judge of 'character'?
A = Every once in a while
B = Sometimes
C = Usually
D = Almost always
E = Always
F = I don't know

88. Do you usually know how to make people feel comfortable and at ease?
A = Every once in a while
B = Sometimes
C = Usually
D = Almost always
E = Always
F = I don't know

89. Do you generally take the good advice of friends?
A = Every once in a while
B = Sometimes
C = Usually
D = Often
E = Almost always
F = I don't know

90. Are you generally at ease around (men or women) your own age?
A = Rarely
B = Sometimes
C = Usually
D = Almost all the time
E = Always
F = I don't know

91. Are you good at understanding (girlfriend's or wife's) (boyfriend's or husband's) ideas and feelings?
A = Every once in a while
B = Sometimes
C = Usually
D = Almost all the time
E = All the time
F = I don't know. Does not apply.

92. Are you an easy person for people to get to know?
A = Not at all
B = Pretty hard
C = Fairly easy
D = Easy
E = Very easy
F = I don't know

93. Do you have a hard time coping with children?
A = Usually have a hard time
B = Sometimes it is hard
C = Usually easy
D = Almost always easy
E = Always very easy
F = I don't know

94. Have you ever had interest in teaching, coaching or counselling?
A = Very little or none
B = A little interest
C = Some interest
D = A lot of interest
E = A great deal of interest
F = I don't know or doesn't apply

95. Can you do well when working with the public in jobs such as sales, receptionist, promoter, police or waiter?
A = Fair
B = Fairly well
C = Well
D = Very well
E = Excellent
F = I don't know. Does not apply.

96. Do you prefer working alone or with a group of people?
A = Always alone
B = Usually alone
C = No preference
D = Usually with a group
E = Always with a group
F = I don't know

97. Are you able to come up with unique or imaginative ways to solve problems between people or settle arguments?
A = Maybe once or twice
B = Every once in a while
C = Sometimes
D = Often
E = All the time

98. Do you have a clear sense of who you are and what you want out of life?
A = Very little
B = A little
C = Usually
D = Most of the time
E = Almost all the time
F = I don't know

99. Are you aware of your feelings and able to control your moods?
A = Every once in a while
B = Sometimes
C = Most of the time
D = Almost all the time
E = Always
F = I don't know

100. Do you plan and work hard toward personal goals like at school, at work or at home?
A = Rarely
B = Sometimes
C = Usually
D = Almost all the time
E = All the time
F = I don't know

101. Do you 'know your own mind' and do well at making important personal decisions such as choosing classes, changing jobs or moving?
A = No or every once in a while
B = Sometimes
C = Usually
D = Almost all the time
E = All the time
F = I don't know

102. Are you happy with the work you choose because it matches your skills, interests and personality?
A = No or rarely
B = Sometimes
C = Usually
D = Almost all the time
E = All the time
F = I don't know

103. Do you generally know what you are good at (or not good at) doing and try to improve your skills?
A = Every once in a while
B = Sometimes
C = Usually
D = Almost all the time
E = All the time
F = I don't know

INTRAPERSONAL

104. Do you get very angry when you fail or are frustrated?
A = Almost all the time
B = Sometimes
C = Every once in a while
D = Rarely
E = Almost never
F = I don't know

105. Have you ever had interest in 'self-improvement'? For instance, do you attend classes to learn new skills or read 'self-help' books or magazines?
A = No
B = A little
C = Sometimes
D = Often
E = Almost always
F = I don't know

106. Have you ever been able to find unique or unusual ways to solve personal problems or achieve your goals?
A = Once or twice
B = Every once in a while
C = Sometimes
D = Often
E = All the time
F = I don't know

NATURALIST

107. Have you ever raised pets or other animals?
A = Never or rarely
B = Every once in a while
C = Sometimes
D = Often
E = All the time
F = I don't know

108. Is it easy for you to understand and care for an animal?
A = Not at all
B = Maybe a little
C = Fairly easy
D = Quite easy
E = Very easy
F = I don't know

109. Have you ever done any pet training, hunting or studied wildlife?
A = No
B = A little
C = Sometimes
D = Quite a bit
E = A great deal
F = I don't know

110. Are you good at working with farm animals or thought about being a veterinarian or naturalist?
A = Not at all
B = A little
C = Some
D = Quite a bit
E = Very much so
F = I don't know

111. Do you easily understand differences between animals such as personalities, traits or habits?
A = Not at all
B = A little
C = Fairly easy
D = Quite easy
E = Very easy
F = I don't know

112. Are you good at recognising breeds of pets or kinds of animals?
A = Not at all
B = A little
C = Somewhat
D = Quite good
E = Very good
F = I don't know
F = I don't know

113. Are you good at observing and learning about nature, for example, clouds, weather patterns, animal or plant life?
A = Never
B = A little
C = Some
D = Quite a bit
E = A great deal
F = I don't know

114. Are you good at growing plants or raising a garden?
A = Not at all
B = A little
C = Somewhat
D = Quite a bit
E = Very good

115. Can you identify or understand the differences between types of plants?
A = Not at all
B = A little
C = Somewhat
D = Most of the time, yes
E = All the time
F= I don't know

116. Are you fascinated by natural energy systems such as chemistry, electricity, engines, physics or geology?
A = No
B = A little
C = Somewhat
D = Quite a bit
E = A great deal
F = I don't know

117. Do you have a concern for nature and do things like recycling, camping, hiking or bird watching?
A = No
B = A little
C = Some
D = A lot
E = A great deal
F = I don't know

118. Have you taken photographs of nature or written stories or done artwork?
A = No
B = A little
C = Some
D = A lot
E = A great deal
F = I don't know

119. Is spending time with nature an important part of your life?
A = Not really
B = A little
C = Somewhat
D = Quite a bit
E = Very much so
F = I don't know

You're finished!!

MI Assessment Preferences Questionnaire

The aim of this survey is to find out your personal views in relation to assessment preferences. I am currently studying for a Doctorate in Healthcare in King's College London. As part of my study I am developing an Index of Assessment Preferences, which is based on multiple intelligences (MI) and learning styles. Howard Gardner (1983) describes eight intelligences in his theory of MI. These include linguistic, logical – mathematical, interpersonal, intrapersonal, spatial, kinesthetic, naturalistic and musical intelligence. Unlike learning styles, which express student preferences for learning in one way or another, multiple intelligences exist within each person in varying degrees.

By answering this survey you will provide me with information that may show a relationship between your multiple intelligences profile and your learning style preferences in relation to assessment methods. Your name and all information gathered both during and after the research study will be anonymised in accordance with the Data Protection Act (2003). The information that you provide will only be used for educational purposes by the researcher and the participants in the study. All of the data will be stored securely and will only be seen by the researcher.

This survey is 4 pages long and will take approximately 5-10minutes to complete. Please answer all questions.

If you require further information or clarification regarding this questionnaire please contact me.

Ms. Linda Sheahan (Doctoral Student)
Department of Nursing
Waterford Institute of Technology
Cork Road Campus
Waterford

Thank you for taking the time to complete this questionnaire.

Personal Identification Number _____

Consent

□ I consent to take part in this study

□ I understand I can with draw from this study at any time

2. Assessment preferences

In this section you are given a number of choices in relation to different types of assessment. Please follow the instructions for each question.

Please rank in order of preference 1,2,3 where 1 is your highest preference and 3 is your lowest preference.

2.1 In relation to written assessments …

	Please rank in order of preference
I like written assessments that have a problem solving approach to demonstrate my learning	1,2,3
like written assessments that encourage me to draw	1,2,3

on my experiences from practice to demonstrate my learning	
I like written assessments that include personal journals to demonstrate my learning	1,2,3

Please rank in order of preference 1,2,3,4 where 1 is your highest preference and 4 is your lowest preference.

2.2 In relation to practical assessments...

	Please rank in order of preference
I like practical assessments as they allow me to demonstrate my knowledge	1,2,3,4
I like practical assessment as they allow me to demonstrate my skills	1,2,3,4
I like practical assessments as they allow me to demonstrate my attitude to the subject matter	1,2,3,4
I like practical assessments as they allow me to apply my knowledge to clinical practice	1,2,3,4

2.3 Each item below relates to other assessment methods that could be used to demonstrate your learning, with which you may agree or disagree.
Please tick the box which best describe your views.

Assessments	**Strongly agree**	**Moderately agree**	**Agree**	**Moderately disagree**	**Strongly disagree**	**No opinion**
I like group presentations						
I like online assessments						
I like open book assessment						
I like continuous assessment						
I like peer assessments						
I like to compose poetry to demonstrate my learning						
I like to compose songs to demonstrate my learning						
I like role play to demonstrate my learning						

Other … Please identify

2.4 Each item below is a statement about examinations, with which you may agree or disagree.
Please tick the box which best describe your views.

Examinations	**Strongly agree**	**Moderately agree**	**Agree**	**Moderately disagree**	**Strongly disagree**	**No opinion**
I like seen examinations						
I like unseen examinations						
I like examinations with essay questions						
I like examinations with short answer questions						
I like examinations with multiple choice questions						
I like problem based examinations						
I like practical examinations						
I like oral examinations						
I like examinations that include presentations						
I like examinations that include multiple methods of assessment (for example, problem based questions combined with an MCQ examination)						

3. About yourself

As you are nearing the end of this survey I would like to ask you some information about yourself.

What programme of study are you currently undertaking?

- BSc General nursing
- BSc Psychiatric nursing
- BSc Intellectual disability nursing

Gender

- Male
- Female

What is your age?

- Under 20 years of age
- 20-29
- 30-39
- 40-49
- 50 years or older

Conclusion

Thank you very much for taking the time to complete this questionnaire. The results of my study may be used to support academic work. If you would like to know the findings of my study please email me to request a synopsis at the e mail address provided.

Appendix 12 MITA Skills Sheet Rubric and Traditional Skills Sheet

Nebuliser therapy and peak flow measurement

Question: In this lesson I ask what is your understanding of nebulizer therapy and peak flow measurement and why is it important for you to learn this skill for clinical practice?

Target: Plan for interventions Novice to Expert on the skill nebulizer therapy and peak flow measurement and the students' background information of same. This will be checked at the end of the one hour session.

Expect: The rubric below shows what I expect the group to learn in the session

- Research on the latest information in relation to nebuliser therapy and peak flow measurement.
- Perform the skill of peak flow measurement
- Perform the skill of nebuliser therapy
- Evidence of clear understanding for the reasons for peak flow measurement and nebuliser therapy
- Demonstrate how to dispose of used equipment safely
- Each team member shares specific findings at the end of the 1 hour session

Move: In pairs each student shares what they have learned in relation to nebuliser therapy and peak flow measurement and its impact for patient / client care.

Group	Two-footed Questions	Measurable Targets	Assessment Task Ideas
1-Math	What is nebulizer therapy and why would it be used in clinical practice? How does peak flow measurement impact on this?	Graph the patient / client's records. Read the peak flow result. Illustrate this on a chart.	Graphs, statistics, problem solving, record sheets, oxygen saturation monitor. Take peak flow measurements before and after exercise.
2-Music	How do you observe music's impact on a person requiring nebuliser therapy?	Present music to move brain waves.	Compositions, background music, integrate music and learning, see effect on breathing rate
3-Intra	What are the experiences of people who have to receive nebuliser therapy and peak flow measurement and how can you relate to this?	Group questions and answers.	Personal stories, previous experience, role model, database enquiry, ask a patient who has received nebuliser therapy for their experiences.
4-Inter-	What is the impact of applying a nebuliser mask and how can you show empathy towards them?	Demonstrate the skill Collaborate with colleagues.	Shared stories, collaboration, team teaching, simulation
5-Kinisth.	How can you express the skill of applying the nebuliser mask through movement? How can you express the skill of peak flow through movement?	Demonstrate the skill of nebulizer therapy and peak flow measurement.	Use of the mannequin to carry out skill. Place the nebuliser mask on a student. Take peak flow measurements before and after exercise.
6-Natural	What impact does nature have for nebuliser therapy?	Recreate natural setting in the skills laboratory for the demonstration of the skill.	Compare and contrast natural settings. Go outside and take a walk. Take peak flow measurement levels.
7-Spatial	How would a spatial diagram help demonstrate knowledge of the skill of nebuliser therapy and peak flow measurement?	To think in pictures that will lead to remembering the steps in the process. Mind map, spider diagram	Create a poster, draw a diagrammatic representation, mind map, spider diagram. Demonstrate on a white board.
8-Linguist	How would you use words to describe the skill of administering nebuliser therapy?	Create a case study or vignette	Write up the skill through story format, use powerpoint. Describe experience of going outside, taking fresh air and comparing peak flow readings

Reflect: Each student reflects on their learning using Driscoll's Model (2000) in relation to the clinical skill of nebuliser therapy and peak flow measurement.

What?
So what?
Now what?

Preparation for skill

Check doctors orders or the patient's care plan
Drug chart
Gather equipment
Perform hand hygiene
Explain purpose of procedure and provide instructions to the patient for use of nebuliser
Ensure patient is sitting upright to allow for lung expansion
Check patient identification
A peak flow reading may be required prior to nebuliser therapy
Face cloth or towel
Mouthwash

Equipment

Prescription chart
Nebuliser mask and chamber
Solution for nebuliser

Continuation

Check expiry date of equipment
Open packaging and place equipment on a trolley
As per prescription, place correct drug in the chamber. Attach the mask to the chamber at one end and attach the oxygen tubing at the other end.
Connect the tubing to the flow meter and turn to on to make sure a mist appears in the mask. Turn off oxygen
Place the mask securely over the face and secure the strapping.
If using mouthpiece nebuliser then seal lips over this part.
Turn the flow meter to **6litres** / minute
Explain to the patient that vaporisation may take up to 15 minutes to take place.
Leave a call bell with the patient.

Completion

When vaporisation is complete make sure the mask is left clean and dry for next use.
Offer the patient a face cloth to clean and dry the face when finished.
Offer a mouthwash if required.
Leave the patient in a comfortable position
The nurse may need to have a peak flow reading done post procedure. Record the result in appropriate nursing documentation.
Ensure drug is recorded.
Perform hand hygiene.

References

Booker R. (2007) Correct use of nebulisers. *Nursing Standard,* 22(8), 29-31.
Smith SF, Duell DJ and Martin BC. (2008) *Clinical Nursing Skills.* 7th edn. Pearson, New Jersey.

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Appendix 13 MITA Evaluation Form

Evaluation of clinical skills teaching 2012 using MITA.

This evaluation offers an opportunity for you to provide information to the lecturer in order to help her improve the quality/effectiveness of teaching clinical skills using Multiple Intelligence Teaching Approach (MITA). Your considered response to each statement is appreciated.
Attached you will find statements about your lecturer. Below each statement is a list of numbers. Please show the extent to which you agree or disagree with each statement by circling one of the numbers that follows each statement

Please use the following scale:
1 = Strongly Disagree (SD)
2 = Disagree (D)
3 = Neutral (N)
4 = Agree (A)
5 = Strongly Agree (SA)

Items	**SD**	**D**	**N**	**A**	**SA**
Was well prepared for the skills lecture	1	2	3	4	5
Motivated me to want to understand the MITA approach to learning clinical skills	1	2	3	4	5
Was interested in helping me to understand clinical skills using MI approach	1	2	3	4	5
Everybody in the group was helped to understand the MI approach to teaching clinical skills	1	2	3	4	5
Answered all my questions when I did not understand	1	2	3	4	5
Related the skills teaching to real life situations using the MITA approach	1	2	3	4	5
Gave clear explanations of MITA approaches to the learning and teaching of clinical skills	1	2	3	4	5
Held my attention	1	2	3	4	5
Presented the information in a way that will help me learn and understand in the future	1	2	3	4	5

The most positive aspect of the skills teaching sessions was…

The least positive aspect of the skills teaching session was…

What recommendations would you make for the future for the teaching of clinical skills?

Any further comments?

Appendix 14 Conference Publications

Conference presentations				
Presentation type	**Date (mm/yy)**	**Title**	**Conference**	**Location**
Oral presentation	05/2013	An exploratory trial exploring the use of MITA for teaching clinical skills to first year undergraduate nursing students.	International Clinical Skills Conference	Prato, Italy
Poster	05/2013	More than one way to be smart.	International Clinical Skills Conference Won first prize	Prato, Italy
Poster	04/2013	More than one way to be smart.	Waterford Institute of Technology	Waterford
Oral presentation	03/2013	An exploratory trial exploring the use of MITA for teaching clinical skills to first year undergraduate nursing students.	Royal College of Nurses	Belfast
Oral presentation	02/2013	An exploratory trial exploring the use of MITA for teaching clinical skills to first year undergraduate nursing students.	Royal College of Surgeons	Dublin
Oral presentation	11/2012	Teaching clinical skills to undergraduate nurses using a multiple intelligences teaching approach – an experimental study	Trinity College	Dublin
Poster	06/2011	Unlocking your potential	King's College	London
Poster	06/2011	More than one way to be smart. Won award for this poster.	King's College	London